

THE
PAN-PACIFIC ENTOMOLOGIST



Published by the
Pacific Coast Entomological Society
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The California Academy of Sciences

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Published quarterly in January, April, July, and October with Society Proceedings appearing in the January number. Papers on the systematic and biological phases of entomology are favored, including articles up to ten printed pages on insect taxonomy, morphology, life history, and distribution.

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Prepublication Price \$5.00

Regular Price \$6.00

Send orders to: Treasurer, Pacific Coast Entomological Society, California Academy of Sciences, San Francisco.

Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

BIOLOGICAL STUDIES ON THREE FORMS OF THE TWO-SPOTTED SPIDER MITE

(Acarina: Tetranychidae)

DONALD W. DAVIS
Sacramento, California

According to McGregor (1942) the appropriate name for the two-spotted spider mite is *Tetranychus bimaculatus* Harvey, although names such as *T. telarius* (Linn.) or *T. urticae* Koch are often used by other workers. Actually, however, the two-spotted spider mite, as it is currently determined is a complex of species or strains which differ from one another in color, host range, ability to cross breed, or some small morphological characters. The present study is concerned with biological studies of three forms of spider mites, two of which were determined by E. A. McGregor as *T. bimaculatus*. The third form, taken on a potted hydrangea plant from San Francisco, was stated by A. E. Pritchard to be a member of this complex.

Little morphological evidence was noted to separate the three forms, aside from very slight differences in the aedeagus. A. E. Pritchard (personal communication) found that one form could be distinguished from the other two by the chaetotaxy of the front legs of the female. A ring of six setae occurs at the base of the front tarsus (fig. 1) and thirteen setae occur on the front tibia of the females of this form. In contrast to this, females of the other two forms each have a ring of four setae at the base of the front tarsus (fig. 2) and ten setae on the front tibia. The fore legs of the males of all forms have six proximal setae on the tarsus and thirteen tibial setae. For convenience in this paper the forms will be referred to as "six-setae,"¹ "four-setae" and hydrangea mites.

Color, while often of limited use in mite taxonomy, may be important in the case of spider mites. Ewing (1914) conducted feeding experiments and reached the conclusion that yellows, greens and brown of the "common spider mite" are variations due

¹Since this paper was submitted for publication, the name *Tetranychus multiseta* McGregor has been given to the mite referred to as the "6-setate" form herein. See E. A. McGregor, 1950. Mites of the Family Tetranychidae. American Midland Naturalist, 44(2):257-420.

to nutrition, but orange and red shades are constant and will not change even after death. Ewing as well as Cagle (1949) stated that the dark areas on the mites vary in size, shape and number due to nutrients.

Adult females of the three forms of mites discussed in the present paper were red at all times and under all the experimental conditions. In no case were females observed to exhibit the pale yellowish-orange color of overwintering females of certain other spider mites, nor were shades of brown and green encountered.

In an attempt to see if color could be used for separation of the individual forms under study, a mixed colony was started. The extremes in intensity of red were later isolated and mounted, but no correlation was found between the selections and the number of setae on the tarsus.

There is a difference in the color of the males, however. The males of the hydrangea mite are a distinct red which is nearly the same color as the females. The males of the other two forms are never a true red, but are more nearly flesh colored.

Extensive measurements of length were made on all life stages of these three forms of mites, but no significant differences were found. Life history studies showed no great differences in duration of the life cycle or the number of offspring.

As far as it could be determined, there is no difference in the host range of the "four-setae" and "six-setae" forms. The hydrangea mite, however, exhibited a distinctly different host range as it is the only form capable of surviving on hydrangea leaves, and the only one not capable of feeding on the surface of banana squash fruit. All three forms could live and reproduce well on bean leaves. Strawberry and violet could support all three forms, but were unsatisfactory as experimental hosts.

In order to determine if the setal characters were simply genetic variations within a single species, a mixed colony of "4-setae" and "6-setae" mites was established, and 73 adult females were taken at random from this mixed population. These females were in all probability fertilized individuals. All 73 females gave rise to colonies, and 60 of these colonies were successfully carried to F_1 adults. Of these 60, twenty-two had "4-setae" female parents, and 38 had "6-setae." In every case there were female offspring, and all examined were of the same type as the female parent. Wherever possible six or more F_1 females from each colony were mounted

and compared with the female parent. All together some 200 F_1 females were studied. In all cases the female parents were removed and mounted prior to the emergence of the first female F_1 . Some of the colonies were carried into F_2 and F_3 generations, but the females always remained of the same type as the original female parent.

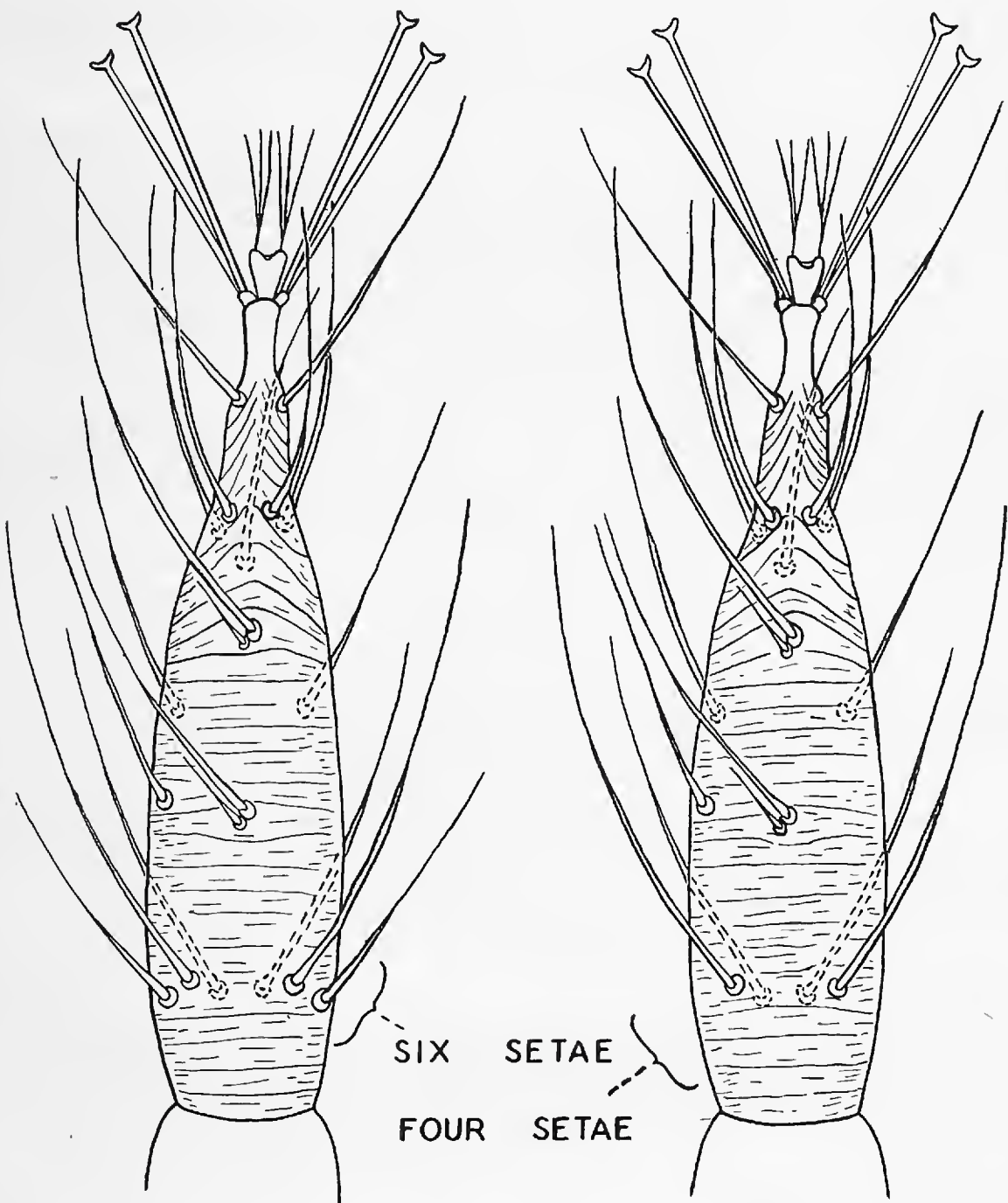


Fig. 1.

Fig. 2.

Fig. 1. Dorsal view of the front tarsus of a female spider mite of the "six-setae" form. X 600.

Fig. 2. Dorsal view of the front tarsus of a female spider mite of the "four-setae" form. X 600.

A series of crosses was made to determine whether or not these three forms of mites would cross or whether they were genetically isolated. Colonies which had been started from single females, were maintained as a source of pure stock throughout the series of experiments. The hydrangea mite stock was kept on hydrangea leaves, and the other two forms were reared on banana squash. Periodically slide mounts were made and examined to be certain that the stock remained pure. In addition the female parents of each cross were mounted and examined for any possibility of contamination.

The technique used involved isolation of female deutonymphs. This guaranteed adult females to be virgins, as fertilization takes place only in the adult stage. Most of the crosses were made in single leaf cages on either bean or hydrangea leaves. The type of cage employed was developed by the Division of Biological Control, California Agricultural Experiment Station at Riverside, California, and has been used extensively both at Riverside and at their station at Albany, California.

The cage consists of a backing of waterproof ply-wood which is bordered by a strip of rubber. Inside this rubber barrier is placed a square piece of blotting paper covered with cheese cloth. A detached leaf is placed on the cheese cloth, and over this a fairly thick piece of plexiglass with a 1½ inch hole is placed to form a cell in which mites can be reared and studied. The plexiglass is held down and in place with rubber bands. The cell is covered by a thin sheet of transparent plastic fused to the plexiglass with acetone. The leaf used must be large enough to completely cover the base of the cell. The leaf is kept fresh by adding moisture to the blotter daily, or at least every second day. Bean leaves survived up to three weeks in these cages, and hydrangea leaves up to seven weeks.

To make crosses between the "four-" and "six-setae" forms, mature males and female deutonymphs were taken from the above colonies which had been established from single females. In interpreting the results of the cross-breeding experiments, it must be recognized that unfertilized females produce males only, while fertilized females produce both males and females, but with a preponderance of the latter.

Twenty-eight crosses were made between the "four-setae" and "six-setae" stocks. Sixteen of these were between "four-setae" females and "six-setae" males, and 12 were the reciprocal. Twelve of the crosses failed to produce adult offspring. Of the 16 remain-

ing crosses, 15 contained female and male offspring in a normal proportion. In every case the female offspring were of the same type as the female parent. In three of the colonies the F_1 individuals were inbred and carried through several generations. In every case the females remained the same type as the original female parent. In one cross of the original 16, there were no female offspring. Only one male was used in each cross, and it is possible that in this case the male was injured or killed so that copulation did not take place.

Further investigations were conducted in which hydrangea mites were crossed with the other two forms. A total of 18 crosses was made in which three female deutonymphs and two or three adult males were used in each cross. Four crosses were made on bean leaves, and 14 crosses were attempted using hydrangea leaves. Due to the fact that the "four-" and "six-setae" forms will not survive and reproduce on hydrangea leaves, the latter crosses all employed female hydrangea mites and males of the other forms. Several instances of copulation were observed. Of all the attempted crosses, only males were obtained, and in some cases more than 50 males were present in the F_1 population. All of the crosses employing hydrangea females gave rise to red males of the hydrangea type. The other crosses gave rise only to flesh colored males.

SUMMARY

The two-spotted spider mite², as currently determined, is a complex group. Three forms which were determined as belonging to this complex formed the basis of the present study. The females of all three forms were red under all experimental conditions.

A form which occurs on hydrangea was shown to be unable to cross with either of the other two forms, as evidenced by the lack of females in the F_1 . The hydrangea form further differs from the others in host range, as it lives on hydrangea but is unable to survive and breed on banana squash. The males are red in this mite but not in the others.

The other two forms studied differed in the chaetotaxy of the front legs of the female. However, no differences in host range or habits were observed. On crossing these two forms, offspring of both sexes were obtained. The inheritance of the setation, however, is unique in that it was found to pass down from mother to daughter, regardless of the male used.

²See footnote 1.

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A LARVA OF *TRICHODES ORNATUS* FROM A POLLEN
TRAP ON A HIVE OF HONEY BEES

WILLIAM P. NYE and GEORGE E. BOHART¹

An apparently full-grown larva of *Trichodes ornatus* (Say) was found in December, 1950, in a tight honey tin containing stored pollen. In June of the same year this pollen was taken from a pollen trap on a hive of honey bees at North Logan, Utah. It is reasonably certain that the clerid larva was subsequently transferred from the pollen trap into the can of pollen.

Linsley and MacSwain,² who studied the life history of this clerid, found no records of it as an inhabitant of honey bee hives, although *Trichodes apiarius* (L.) has been recorded but not verified as a hive inhabitant in Europe. The known hosts of *T. ornatus* include a number of genera of solitary bees and also *Odynerus* and *Pseudomasaris* in the Vespidae. Linsley and MacSwain found that the larvae were able to complete their growth on *Odynerus* prepupae in five weeks but required 17 weeks to develop on pollen.

It is known that as an adult this clerid inhabits flowers (especially composites), where it feeds on pollen and living insects and oviposits on the undersides of the capitula. The first-instar larvae presumably attach themselves to visiting Hymenoptera and are carried back to the nests. The larva found in the can of pollen was probably carried to the hive in this manner and then scraped off by the pollen trap screen. It seems surprising that *Trichodes* larvae do not more frequently become established in honey bee colonies.

¹U.S.D.A., Agr. Res. Adm., Bureau of Entomology and Plant Quarantine in cooperation with the Utah Agricultural Experiment Station.

²Linsley, E. G., and J. W. MacSwain. Observations on the life history of *Trichodes ornatus* (Coleoptera, Cleridae), a larval predator in the nests of bees and wasps. Ann. Ent. Soc. Amer. 36(4):589-601. 1943.

THE EMERGENCE, FEEDING HABITS, AND HOST OF OPSEBIUS DILIGENS OSTEN SACKEN

(Diptera Acroceridae)

EVERT I. SCHLINGER

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Except for the report by Melander (1902) that the host of *Opsebius pterodontinus* Osten Sacken was *Agelenopsis naevia* (Walckenaer) (given as *Angelena naevia* Bosc.), biological information on this genus of acrocerids is wanting. Therefore the following notes may be of interest.

Immature female spiders of *Hololena curta* (McCook), were collected near Monrovia, Los Angeles County, California, on February 1, 1950. On March 20th at 10:02 p.m., while feeding this group of field-collected spiders, I noticed one individual spinning a web which resembled a protective moulting web, although the spider did not have the darkened appendages which are characteristic of the pre-moulting condition. The finished web completely surrounded the spider, which left just enough space on the inside for it to change its position. The spider then assumed this attitude: it placed its legs firmly upon the dorsal surface of the moulting web, with the ventral side of the abdomen facing upwards. It appeared nervous, making many jerking motions after which a swath of silk was added to the already heavily coated webbing.

At 10:44 p.m. the spider's abdomen dropped as if by an uncontrolled movement, and the spider then remained motionless for three minutes after which the parasitic larva emerged as follows: a very small hole appeared on the ventral surface of the spider's abdomen along the epigastric furrow, slightly to the left of the longitudinal median line. This hole then enlarged along the furrow, and the posterior part of the larva was seen to emerge. The larva remained colorless for a period of thirty seconds, at the end of which time fat bodies began to appear, and seemed to be pushed out in rhythmic motions. Large protuberances soon appeared as pseudopods bearing setae at their apices. Two rather long, dorsal, caudal spiracles appeared, disappeared and reappeared in an even respiratory count. These spiracles were visible for about twenty minutes at which time they seemed to disappear completely. The emergence of the larva seemed to be aided by the rhythmic contractions of its body, and during this period the visible portion of the larva protruding from the host noticeably increased in size.

The larva withdrew just enough to attach the posterior part of its body to the host's webbing, and then partially re-entered the host's abdomen. Four sets of setae were visible, each set divided into two rather distinct parts, and the posterior pair held the larva to the host's webbing. At 10:52 p.m. the head of the larva was partially visible through the integument of the spider, and could be seen feeding on the ventral abdominal surface. The host was apparently still alive as leg movements persisted.

At 11:03 p.m. the legs of the spider began to fold in towards its body, and since the abdomen was greatly shrunken the spider was assumed to be dead. The mouthparts of the larva were clearly seen invading the silk glands and other tissues along the ventral surface of the abdomen. The mouthparts were small (0.5 mm.), black, and heavily sclerotized. They evidently consisted of two major parts: a movable plate-like labrum, and a movable "U-shaped" mandible. While feeding on the ventral surface, the mouthparts seemed to move back and forth smoothly in an arc of about 2 mm. At 11:06 p.m. the external part of the larva measured 6 mm. in length and 3 mm. in width. The fifth set of setae was visible as the larva forced part of its body out, leaving the spider attached to the webbing by its left foreleg only.

At 11:12 p.m. the larval head was seen probing the tissues of spinnerets and this region was the site of intense feeding activity, with the larva entering and re-entering this tissue about eight times. While feeding, the mouthparts moved up and down at the rate of 2.5 movements per second. This rate continued, with little rest, throughout the entire feeding period. By 11:33 p.m., the normally brownish pigment of the spider's abdomen seemed to be almost white, with the exception of the spinnerets and the epigastrium. From 11:33 p.m. to 12:25 a.m. the larval head was seen invading tissues in the cephalothoracic region for the first time. After fifteen minutes of feeding on the nervous and other related tissues, it began ingesting the contents of the legs.

The following list of numbers refers to figure 1 and will show the sequence of feeding while in the cephalothoracic region: (2), (1), (2), (4), (8), (7), (6), (3). The feeding in the above areas was confined to coxal regions with only intermittent feeding along the margins of the sternum. Feeding in the following sequence, (3), (2), (9), (10), (4), (1), (6), (9), (7), (8), (4), (3), (2), (5), denotes complete evacuation of nearly all the tissue and total

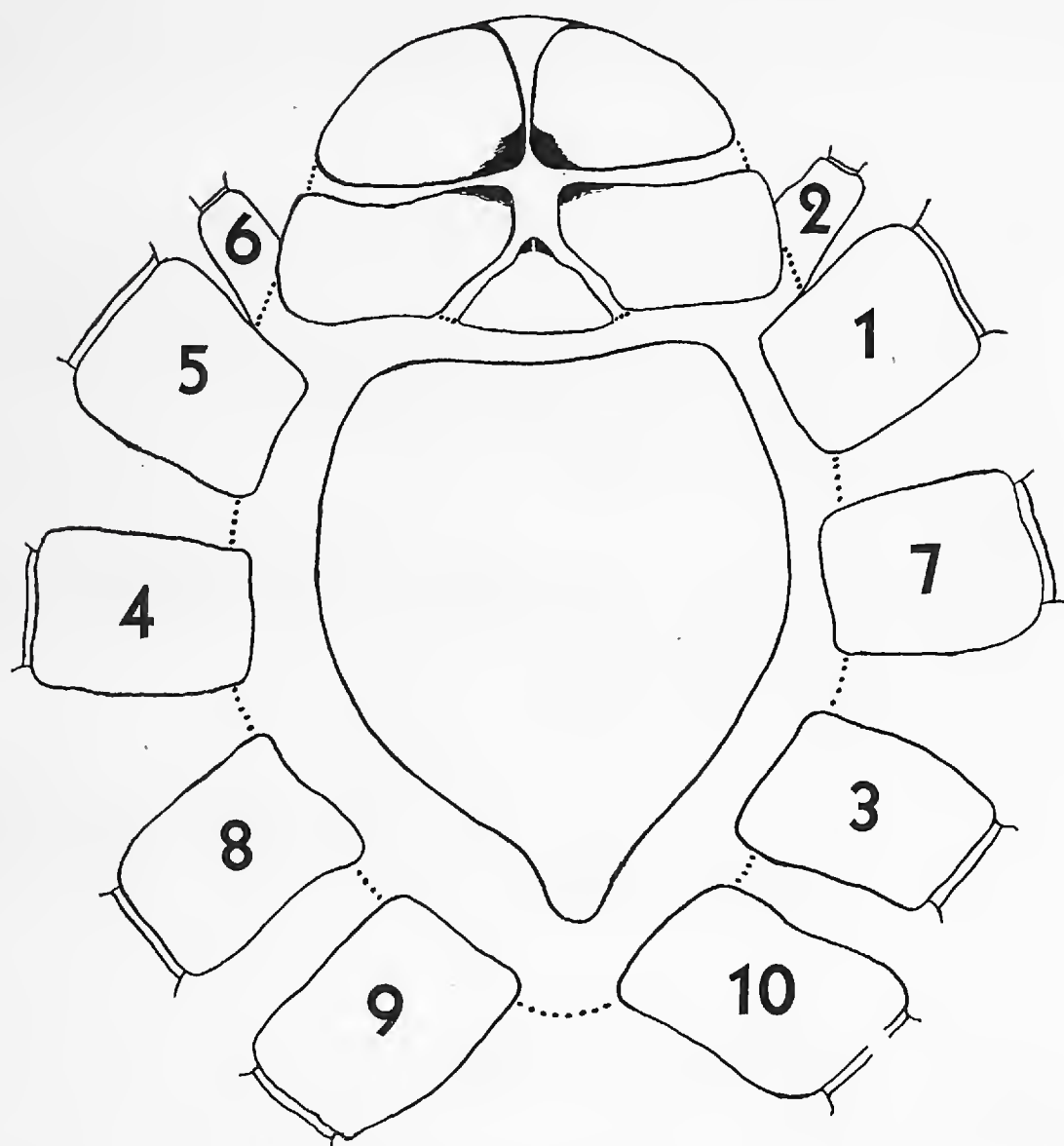


Fig. 1. Ventral sternal view (semidiagrammatic) of *Hololena curta* (McCook). Numbers refer to feeding sequence of parasite.

collapse of the trochanters, femora, and most of the tissues of the tibiae as well as the tissues of the pedipalps and chelicerae. This nearly complete collapse of the legs agrees with King (1916) who observed for *Pterodontia flavipes* Gray that, "the cephalothorax and legs were also eaten out so that the remains resembled a cast skin." This was in contrast to Kaston (1937), who observed for *Ogcodes pallidipennis* Loew¹ (given as *Ogcodes costatus* Loew) that "the cephalothorax and coxae were eaten out as well as the abdomen, but only the latter was shriveled."

The total time involved for cephalothoracic feeding apparently

¹According to Sabrosky (1944) *Ogcodes costatus* Loew is a synonym of *O. pallidipennis* Loew.

exceeded three hours, as my observations ended at 3:36 a.m. The total time used for external feeding probably exceeded five hours.

At 8:00 a.m., March 21st, the larva was found separated from the host and was adjusting itself to the protective webbing. All five sets of setae were fastened to the protective webbing and many small droplets, which were apparently exuded from the oral orifice, were seen on the webbing where the setae were attached, and also in places not adherent to the larva. During the day, the larva was observed many times stretching out and reaching a length which was about two times its original stationary length. The larva became motionless on March 22nd, and measured 6.5 mm. in length. On March 23rd, a rather long (7 mm., black coiled meconium appeared adhering to the caudal segment. On March 24th the larva pupated, the pupa being light brown and growing darker in color, until March 29th when the adult emerged. The parasite, a male, measured 4.5 mm. in length. The imago was then placed in a large cage (15" x 20" x 36") which was placed outside the laboratory under natural conditions. The specimen died April 29, 1950, thus showing an actual adult longevity of 30 days. The temperature and humidity conditions until the emergence had been fairly constant, the temperature being near 70° F., and the relative humidity near 60%. The temperatures under natural conditions varied from 45° F to 65° F with a relative humidity slightly lower than was recorded in the laboratory.

Another male *O. diligens* was reared from the same host species under the same conditions on April 21, 1950. This specimen died on May 29, 1950 (longevity 38 days).

Several other rearings of *O. diligens* from *Hololena curta* were obtained under extremely unfavorable conditions and gave the following longevity records:

- 1.) The host was collected near Davis, Yolo County, California, February 20, 1949. The larva emerged March 11th. The imago, a female, emerged March 24th and died April 3, 1949 (longevity 10 days).
- 2.) The host was collected at Davis, Yolo County, California, March 22, 1949. The larva emerged April 23rd. The imago, a female, emerged May 5th and died May 9, 1949 (longevity 4 days).
- 3.) The host was collected in the foothills near Monrovia, Los Angeles County, California, April 26, 1949. The larva emerged May 9th. The imago, a female, emerged May 20th and died May

29, 1949 (longevity 9 days).

4.) The host was collected in the foothills near Monrovia, Los Angeles County, California, April 26, 1949. The larva emerged May 17th. The imago, a male, emerged May 25th and died June 6, 1949 (longevity 12 days).

5.) The host was collected at Glendale, Los Angeles County, California, April 28, 1949. The larva emerged May 18th. The imago, a male, emerged May 26th and died June 11, 1949 (longevity 16 days).

The average longevity for these five specimens was 10 days. This short span was probably due to unfavorable rearing conditions.

SUMMARY

The emergence and external feeding of *Opsebius diligens* Osten Sacken on its host *Hololena curta* (McCook) is given in detail. The external feeding exhibited by this parasite is believed to be unique among parasitic Diptera. The formation of a protective web by the host spider prior to the emergence of the parasite is thought to be due to some sort of internal pressure applied by the internal larva in a specific region of the spider's body which in turn forces the production and spinning of the silk. This webbing serves as an excellent cocoon for the protection of the developing parasite. It was found that the host remained alive for nearly fifteen minutes after the emergence of the parasitic larva.

The total length of time observed for the external feeding of the larva was four hours and forty-nine minutes with five hours or more of actual feeding probably required.

The longevity of the two specimens reared under favorable conditions reached 30 and 38 days respectively. The longevity of the five specimens reared under unfavorable conditions averaged only 10 days.

The writer wishes to thank Dr. R. L. Doutt and Dr. R. M. Bohart for their helpful suggestions and criticisms of this paper, and Dr. W. J. Gertsch for determining the host spider.

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A THIRD MEXICAN SPECIES OF GENUCHINUS

(Coleoptera: Scarabaeidae)

EDWIN C. VAN DYKE

California Academy of Sciences, San Francisco

***Genuchinus grandis* Van Dyke, new species**

Black, subopaque, feebly shining, without maculations and without conspicuous punctures above except on basal portion of scutellum. *Head* with front very minutely and sparsely, indistinctly punctured, the general surface alutaceous; clypeal margin broadly, evenly arcuate and reflexed, shining, feebly asperate laterally, and slightly elevated at middle. *Prothorax* narrowly constricted at apex, producing small right-angled front angles, sides diverging from front to middle, thence almost straight or feebly converging to the broadly rounded hind angles; base somewhat bilobed, side margin narrow in front, broader behind and continuing along the base but interrupted at middle; disc without impressions except a vague median longitudinal groove near base, practically impunctate, a few very minute, scattered punctures only observable. Scutellum large, somewhat depressed at base and coarsely punctured, acutely prolonged backwards and with a well-marked median longitudinal carina at apex. *Elytra* a third broader than prothorax and two and a fourth times as long; shoulders well rounded; sides feebly sinuate behind humeri, thence somewhat arcuate and a bit narrowed to well rounded apices; disc flat, subopaque or slightly shining with a few minute scattered punctures (only observable under high magnification) and with sides feebly wrinkled at middle third, pygidium with a few scattered shallow punctures; pro-pygidium finely and transversely rugose and with a small impression at middle of its hind margin. Undersurface: submentum large, transverse in front, rounded at sides, a bit pointed behind and with sides irregularly elevated; metasternum shallowly, umbilicately and irregularly punctured; all femora rather coarsely punctured, front tibia with a well defined tooth beyond middle of outer margin, and apex pointed and the four posterior tibiae each with a small, sharp spur at middle. Length 23 mm., breadth 9 mm.

Holotype, a unique specimen collected at LA MESA DE LA PUERCOS, 8,000 ft. alt., 12 miles west of YAHUALICA, JALISCO, MEXICO, Aug. 10, 1950, by Andrew Brown, and by him kindly presented to the California Academy of Sciences. This fine species differs from the two previously described Mexican species, *G. V-notatus* Westwood and *G. velutinus* Westwood, by being almost twice as large, of a uniform black color, more or less smooth above, without maculations and without conspicuous punctures above.

THREE NEW ERRHOMUS, WITH A KEY TO THE SPECIES

(Homoptera: Cicadellidae)

P. W. OMAN

*Bureau of Entomology and Plant Quarantine, Agricultural Research
Administration, United States Department of Agriculture*

In connection with the identification of a species of *Errhomus* from the State of Washington, I reviewed the material of this little-collected group which has accumulated since my earlier study of the genus (Proc. U. S. National Museum, 85 (3036): 169-173, 1938). This study revealed the existence of three previously unrecognized species, which are described herein, as well as the misidentification of some of the material reported upon in the earlier paper. Since the number of species has been doubled it also seems desirable to present a revised key for their differentiation.

Errhomus wolfei Oman, new species

Resembling *E. lineatus* (Baker) and *E. montanus* (Baker), but averaging slightly larger than either and the males usually heavily marked with fuscous. Dorsal process of aedeagus short and quadrate in lateral view and distal aedeagal processes not coarsely serrate. Length of male 7 mm., of female 7-8 mm.

Male sordid yellowish brown heavily marked with brown and fuscous on head and thorax, face black excepting irregular lateral areas and small pale maculae on front; forewing fuscous, veins and narrow bordering areas pale. Female pale sordid yellow with irregular pale brown to fuscous maculations. Crown of male nearly twice as long medially as next eye, that of female about two and one-half times as long medially as next eye. Male macropterous, female brachypterous. Nymphs resembling female in general form and coloration.

Aedeagus stout, curved in same arc as styles, with short, keel-like, subquadrate process basally dorsad of shaft; shaft broad, rather flat, with a short terminal digitate process above gonopore and paired lateral processes as illustrated in figs. A and B; gonopore terminal.

Holotype male from WENATCHEE, WASHINGTON, May 10, 1949. Numerous *paratypes* of both sexes and nymphs from Wenatchee taken on various dates from April 15 to June 15 in 1949 and 1950. Other material is at hand from Wenatchee Heights, Monitor, Cashmere and Dryden, Washington. All specimens excepting a pair from Dryden collected by Homer R. Wolfe. The specimens from Dryden, collected by Melander, were previously reported as *lineatus*. Types and paratypes in the U. S. National Museum (No. 60897), paratypes in collection of Mr. Wolfe.

I take pleasure in naming this species for Homer R. Wolfe of the Washington State College Tree Fruit Experiment Station, who encountered it during the course of his work and to whom I am indebted for numerous specimens and interesting observations on its biology. According to Mr. Wolfe the species lives on *Balsamorhiza sagittata* Nuttall, the nymphs first being observed during the first week of April. The first male was observed a short time later, and many cast skins could be found on both sides of the leaves. Copulation was noted during the first week of May. Mr. Wolfe reports that these leafhoppers are alert and can be seen running to the opposite sides of the leaves while the observer is still ten to fifteen feet away. When the plant is disturbed the males fly and the females and nymphs either crawl to the underside of the leaves or jump to the ground and hide in the grass.

***Errhomus similis* Oman, new species**

Superficially identical with *E. lineatus* (Baker) but dorsal aedeagal process much shorter than shaft and distal processes with secondary spine-like projections. Close to *E. wolfei* in aedeagal characters. Length of ♂ 5.75 mm.

Color and form as in *E. lineatus* but available specimens slightly smaller than representatives of that species. Female presumably brachypterous and of the *E. lineatus* type.

Aedeagus curved in same arc as styles, with a small keel-like process basally dorsad of shaft; shaft relatively slender, with a short digitate process at apex and a pair of lateral processes as illustrated in fig. C; gonopore subterminal on caudo-ventral aspect of shaft.

Holotype male and one male paratype from YAKIMA, WASHINGTON, April 18, 1930, S. E. Crumb. One male *paratype* from Ellensburg, Wash., Oct. 17, 1929, S. E. Crumb. One male and one female specimen from Ritzville, Wash., May 19, 1922, M. C. Lane, previously identified as *E. lineatus*, are probably *E. similis*, as is a specimen in the University of Kansas collection taken near Dufur, Oregon, May 5, 1938. These specimens differ slightly from those in the type series in the number and arrangement of the secondary spine-like projections on the lateral processes, but the general structure of the aedeagus is like that of the Yakima material. Type and paratypes in the U. S. Museum (No. 60898).

***Errhomus filamentus* Oman, new species**

Less robust than *E. wolfei*, and the aedeagus with paired basal ventral accessory processes. Length of male 8 mm.

Color sordid yellowish brown, irregularly mottled with brown and fuscous marks. Forewing suffused with pale brown, marked with fuscous along veins; veins pale, occasionally interrupted with fuscous or brown. Crown bluntly triangular anteriorly, median length about one and one-half times length next eye. Male macropterous, female presumably brachypterous.

Aedeagal shaft rather flat, broad basally, gradually narrowed to about half its basal width at apex, slightly recurved, bearing a pair of recurved, acuminate processes distally (fig. D), gonopore subterminal on dorsal side of shaft; accessory processes slightly shorter than shaft, subparallel to shaft, attenuate. Style with short dentate process on ventro-lateral surface at about middle of distal portion.

Described from a single male from OREGON CAVES, OREGON, July 19, 1923, F. H. Wymore. Type in collection of California Academy of Sciences.

KEY TO THE SPECIES OF ERRHOMUS

- A. Eyes somewhat bulbous. Very robust species, males subbrachypterous.
Shaft of aedeagus broad in lateral view.....*oregonensis* (Baker)
- AA. Eyes not bulbous. Relatively slender species, the males macropterous.
Shaft of aedeagus slender in lateral view.
 - B. Lateral processes at apex of aedeagus neither serrate nor with secondary spine-like projections.
 - C. Aedeagus with paired ventral accessory processes arising from base
.....*filamentus* Oman
 - CC. Aedeagus with a single dorsal accessory process arising from base.
.....*lineatus* (Baker)
 - BB. Lateral processes at apex of aedeagus either serrate or with secondary spine-like projections.
 - D. Lateral aedeagal processes with secondary spine-like projections.
 - E. Males more than 6.5 mm. long. Gonopore terminal.....
.....*wolfei* Oman
 - EE. Males less than 6 mm. long. Gonopore subterminal on caudo-ventral aspect of shaft.....*similis* Oman
 - DD. Lateral aedeagal processes irregularly serrate on exterior margins
.....*obesa* Beamer

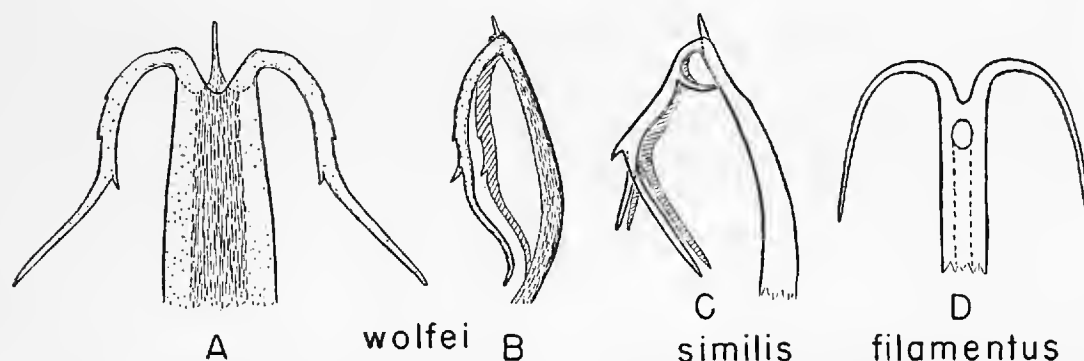


Fig. 1. A, caudo-ventral, and B, lateral view of distal part of aedeagus of *Errhomus wolfei*; C, lateral view of distal part of aedeagus of *E. similis*; D, caudo-ventral view of distal part of aedeagus of *E. filamentus*.

A NEW GALL MIDGE PEST OF TOYON BERRIES

(Diptera: Itonididae)

A. EARL PRITCHARD

University of California, Berkeley

Toyon or Christmas berry, *Photinia arbutifolia* (Ait.) Lindl., is a native California shrub that is often planted as an ornamental because of its large clusters of red berries. Gall midge larvae may feed in the berries and prevent them from developing. L. W. Swan, in connection with a study of the insects on toyon, recently reared adults of this midge. They represent a new species, and it is described in order to provide a name for use in connection with the biological studies.

Asphondylia photiniae Pritchard, new species

Photiniae resembles most other North American species of the genus *Asphondylia* by having three palpal segments. No morphological characters have been used by previous workers to distinguish these species, and each is regarded as being host specific.

Male—Eye bridge very broad. Palpus three segmented, the first very short, the second several times as long as broad, the third long, slender, and narrowing at distal end. Flagellum with 12 segments, the more distal segments slightly decreasing in size. Mesonotum dark brown with geminate, pale and setose median vittae and a pale, setose lateral margin; scutellum brown, densely setose. Wings pale brownish. Claw simple, strongly curved near distal end; empodium moderately broad, as long as claws. Abdomen moderately clothed with short curved setae. Hypopygium with tenth tergite very deeply and triangularly bilobed; tenth sternite widened from base to middle, narrowing beyond middle, and narrowly and deeply emarginate mediodistally; tegmen slender, acutely angulate distally and extending well beyond tenth segment; basiforceps with apodeme slender and parallel sided except for broad, rounded expansion near origin; distiforceps short and plump, with two strong teeth distally. Length of body 3 mm.; length of wing 3.5 mm.

Female—Similar to male, the flagellum, however, with distal segments strongly shortened, the terminal segment broader than long and with a small distal nipple. Unextended opipositor about one-half as long as abdomen. Length of body, excluding extensible portion of ovipositor 3.5 mm.; length of wing 4 mm.

Holotype: Male, Palo Alto, California, May 14, 1951 (L. W. Swan), reared from toyon fruit; in the Pritchard collection.

Paratypes: Eight males, eight females, Palo Alto, California, April 7 and May 14, 1951 (L. W. Swan), reared from toyon fruit.

NEW SPECIES AND NOTES ON CALIFORNIA MAYFLIES

(Ephemeroptera)

W. C. DAY

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During the years 1948, 1949 and 1950, the writer and his wife, Helen L. Day, made numerous short expeditions, collecting Mayflies on the streams of northern California. Much of the area worked lies on the western slope of the Coast Range or above the 5,000 ft. level of the Sierra Nevada, where low temperatures after sundown make collecting at light unproductive. By collecting and rearing nymphs, however, it has been possible to make positive associations between nymph and adult. In the present paper several new species are described, and descriptions given for a few unknown nymphs or adults of known species. Also, drawings are supplied for several known species where additional detail seems desirable or necessary.

E. C. Van Dyke, E. S. Ross and Hugh B. Leech of the California Academy of Sciences have been most considerate in offering facilities and counsel based on their extensive experience. Mr. Leech has joined us on field trips and has been an unfailing source of encouragement and guidance.

Several years ago a fortunate acquaintance was made with George F. Edmunds, Jr., of the University of Utah. Mr. Edmunds has given most generously of his time and wide knowledge of the Ephemeroptera; he has supplied many comparison specimens, checked identifications and descriptions, and made generally available his understanding of this group.

Through the kindness of Henry Dietrich and W. J. Brown, numerous loans of specimens from the Cornell University collection and the Canadian National collection respectively, have been made available to me for comparison purposes. A suggestion from Robert L. Usinger of the University of California resulted in securing the fine illustrations given as part of this paper; they were drawn at the British Museum (Natural History) by Arthur Smith.

***Paraleptophlebia helena* Day, new species**

(Plate I)

Male imago (in alcohol)

Head: Piceous with yellow brown stripe on vertex. Clypeus yellow brown. Compound eyes contiguous, upper portions pale orange and lower portions black. Ocelli milky white. Basal segments of antennae yellow brown; filaments smoky with white tips. *Thorax:* Pronotum medium black brown. Me-

sonotum deep red brown with anterior portion and postero-lateral areas black brown; wide pale band anterior to scutellum, and bordered laterally with pale yellow. Metanotum smoky, scutellum yellow. Sternum red brown with wide yellow band across prosternum. *Legs*: Coxae and trochanters of all legs pale brown with blackish markings. Foreleg uniformly yellow brown with black femoro-tibial joint. Middle and hind legs somewhat paler. All claws pale. *Wings*: Entirely suffused with deep red brown. Subcosta and costal brace of forewing pale yellow brown; all other veins of both wings well defined and dark brown. *Abdomen*: Tergite 1 opaque medium brown with black posterior margin. Tergites 2-7 with one-fifth to one-third in anterior portion hyaline; vague wide median hyaline stripe bordered on each side with submedian black lines; posterior halves of tergites 2-7 with large, pale, almost hyaline areas, one on each side, bordered with black brown; postero-lateral areas surfaced with black. Segments 8-10 opaque orange yellow. All tergites with black posterior margins. Sternites 2-7 semi-hyaline and pale red brown with anterior margins hyaline; a pair of short, oblique hyaline dashes on each sternite. Pleural fold broadly hyaline with wide, dark geminate line above. Black dot on spiracles of segments 2-7. Small black U-shaped mark on each tergite just above geminate line, opening forward. *Genitalia*: Forceps opaque yellow in basal third of long segment; remainder smoky. A large lobe at base of first segment of forceps. *Tails*: Dark brown, narrowly black at each joining. *Size*: Body 9 mm. long; forewing 9.5 mm.; tails 13.5 mm.; foreleg 11 mm.

Female imago (in alcohol)

Head: Yellowish-white with extensive black markings; black dashes from anterior end of median carina to each lateral ocellus; wide black W-shaped mark based on median ocellus and encompassing lateral ocelli; frontal margin dark brown. Ocelli white. Compound eyes black and widely separated. *Thorax*: Mesonotum yellow brown with pale areas anterior to and laterad of scutellum; antero-lateral margins narrowly white. Metanotum yellowish-white with blackish posterior margins. *Legs*: As in male imago, slightly paler. Coxae and trochanters marked with black. *Wings*: As in male imago. *Abdomen*: All segments opaque; ground color pale yellow, widely marked with thin black surfacings. Tergites 2-7 with narrow anterior and wide posterior pale margins except for blackish areas in postero-lateral corners. Also, at each postero-lateral margin, a strong black line crosses pleural fold, extending one-third the distance up toward median line of tergite, and one-quarter the distance down toward median line of sternite; joined to this line is another, extending at right angles along the pleural fold about one-third the distance toward anterior margin. Narrow median pale stripe on tergites bordered on each side by wider dark line. Tergite 10 largely dark. Sternites somewhat paler than ground color of tergites, with central portion of posterior margins pale. Ganglionic areas of sternites pale; sternites 1-7 each with a pair of short, pale submedian dashes near anterior margin. Posterior margin of sternite 7 thickened and immediately beyond the opening of the egg valve is a large, circular brown median spot on sternite 8. Pleural fold as in male. Spiracles marked with a black L-shaped mark. Emargination of subanal plate shallow. *Tails*: Dark brown, narrowly darker at joinings. *Size*: Body and forewing of ♀ imago 0.5 mm. longer than ♂ imago.

Nymph (in alcohol)

Head: Vertex whitish from straight posterior margin of head to lateral ocelli; a wide black V-shaped mark from the black compound eyes to median ocellus; in front of median ocellus a wide white quadrangle, bordered on anterior and lateral edges by a narrow black line. Frontal and lateral margins of head semi-transparent red brown. Antennae 3 mm. long; the two basal segments dark brown, with filaments smoky. A pair of smooth, ivory colored, pointed and incurved mandibular tusks extend forward from head 1.2 mm. *Thorax*: Pronotum yellowish-white, broadly marked with red brown in anterior and lateral portions. In the mature nymph the scutum of the contained subimago is clearly seen as a black bordered dark brown area with wide white median stripe widened into white circular areas at each end. Sclerites of sternum red brown, sutures white. *Legs*: All femora and tibiae yellow white. Femora with large brown spot on frontal edge one-quarter distant from apical end. Tibiae with wide dark brown subapical bands; femoro-tibial joints dark brown. All tarsi brown, darker in the basal half. Claws of foreleg with 22 to 26 denticles. *Abdomen*: Dorsum with pale yellow pattern showing through thin surfacing of black as shown in Plate I, fig. 4. Sternites light yellow with narrow black anterior margins. Lateral extensions of all segments margined with black. *Gills*: Bifid narrowly lanceolate, largest on segments 2-6, smaller on 7, and quite small on 1. Gills divided very close to base; tracheae without branchlets. *Tails*: Pale, with whorls of minute spines and longer hairs at each joining. *Size*: Body 9.5 mm. long; tails 8 mm.

Holotype: Male imago; collected by Helen L. Day on MILL CREEK, VENADO ROAD, SONOMA COUNTY, CALIFORNIA, in October, 1949; in collection of the California Academy of Sciences. *Allotype*: Female imago; same data; in collection of California Academy of Sciences. *Paratypes*: 2 ♂ imagoes, 2 ♀ imagoes, 2 nymphs in collection of California Academy of Sciences; 1 ♂ imago, 1 ♀ imago, 1 nymph in collection of G. F. Edmunds, Jr., 21 ♂ imagoes, 5 ♀ imagoes, and 35 nymphs in author's collection.

The male adult of *P. helena* is distinguished from other *Paraleptophlebia* spp. having nymphs with tusked mandibles, by the deep brown wings. From *P. zayante* (see below), *P. helena* can be separated also by the slimmer abdomen and legs and greater delicacy of the parts of the latter. The nymph of *P. helena* has longer and straighter mandibular tusks than those of *P. zayante*. The emargination of the subanal plate of the female adult of *P. helena* is shallow and semi-circular, while that of *P. zayante* is more deep and narrow.

The nymph was found only on well-aged leaves in quiet, shoal portions of a rapid, small spring-fed stream having a temperature of 48-50° F. Mating flight of the adults begins about one hour before sunset. Association of nymph and adult was established through rearing.

Paraleptophlebia zayante Day, new species

(Plate II)

Male imago (in alcohol)

Head: Black brown with frontal shelf hyaline; median carina, basal sclerite of antennae and dot on vertex, pale yellow. Ocelli white. Compound eyes contiguous; upper portion pale orange and lower portion black. *Thorax*: Pronotum dark red brown with black markings at postero-lateral corners. Mesonotum medium brown with narrow black lateral margins; median and submedian sutures and large postero-lateral areas, pale yellow; scutellum dark brown, anterior to this, a large pale area. Metanotal scutellum pale with narrow dark brown posterior margin. Sternum pale yellow brown. *Legs*: Uniformly light red brown with tarsi darker. Femoro-tibial joint black. *Wings*: Faintly milky white very lightly tinted with palest brown in stigmatic area of forewing. Long veins of forewing and hindwing pale yellow brown, becoming lighter toward rear margins. Crossveins of forewing very fine and pale brown, becoming lighter toward rear margin. Crossveins of hindwing light brown from costa to R_1 , others colorless. *Abdomen*: Segments 1, 8 and 9, and posterior half of 7 opaque. Tergites 2-6 hyaline yellow patterned with a thin surfacing of black; anterior margins are clear hyaline and posterior margins hyaline yellow; narrow hyaline median stripe bordered by wide submedian black lines; laterad of these black lines are wide hyaline lines; laterad of these hyaline lines are large dark areas with a pale area in the center of each. Pleural fold marked for its entire length by a broad, faint dark line. Each spiracle marked with a black dot. The postero-lateral corner with a short, dark line extending upward, and another as short extending forward. Sternites 2-7 hyaline yellow, each with a well-defined central dark brown ganglionic area; a pair of dark dots on each sternite. *Genitalia*: Forceps deep golden brown at base, paling distally; large lobe at base of first segment. Reflex spurs present on penes. *Tails*: Bright red brown entire length, narrowly pale at each joining. *Size*: Body 10 mm. long; forewing 10 mm; tails 12.5 mm.; foreleg 10 mm.

Female imago (in alcohol)

Head: As in male except compound eyes are small and widely separated. A wide chalky white band across the occipital region from eye to eye. *Thorax*: Notum and sternum as in male, slightly darker. *Legs*: As in male, slightly darker. *Wings*: Clear hyaline. Stigmatic area of forewing brown tinted. All veins of both wings as in male, slightly coarser and darker. *Abdomen*: Segments 1-7 pale red brown, translucent; 8-10 opaque. Tergites heavily surfaced with black wash; maculation same as male. Sternites as in male except that ganglionic areas are outlined only in dark brown. *Tails*: As in male imago, darker. *Size*: Body 10 mm. long; forewing 11.4 mm.; tails 12.5 mm.; foreleg 6 mm.

Nymph (in alcohol)

Head: Heavily washed with blackish-brown, a pale area below median ocelli; entire vertex pale. The two basal segments of antennae pale smoky; filaments yellow. A pair of smooth, yellowish, strongly incurved tusks of the mandible extend forward beyond the head. *Thorax*: Notum yellowish, mottled with black. Sternum yellowish, each of the three segments strongly marked

with large black ganglionic area. *Legs*: All segments yellowish-white, each widely banded with brown; femoro-tibial joints dark brown. 18-22 denticles on fore claw. *Abdomen*: Tergites show pale yellow pattern through surfacing of black, as shown in Plate II, fig. 5. Sternites pale, widely washed with black close to lateral margins, each with black ganglionic area. *Gills*: Bifid, lanceolate and divided to base; tracheae black, short and scattered. *Tails*: Pale, joinings narrowly black. *Size*: Body 10 mm. long; tails 9 mm.

Holotype: Male imago; collected by the author on ZAYANTE CREEK, SANTA CRUZ COUNTY, CALIFORNIA during October, 1950; in the collection of the California Academy of Sciences. *Allotype*: Female imago; same data; in collection of California Academy of Sciences. *Paratypes*: All topotypical: 2 ♂ imagoes and 2 ♀ imagoes in collection of California Academy of Sciences; 1 ♂ imago, 1 ♀ imago, 1 nymph in collection of G. F. Edmunds, Jr.; 7 ♂ imagoes, 5 ♀ imagoes and 15 nymphs in author's collection; all collected in October, 1950.

The male adult of this new species is distinguished from the closely related *P. helena* by the pale wings, as well as the genitalia; the prominent dark ganglionic marks of the sternum are completely lacking in *P. helena*. The mandibular tusks of the mature nymph of *P. zayante* compared to those of *P. helena* are one-third shorter, and are heavier and more curved. Nymphs were found in quieter water of running stream, on leaves and branches. Nymphs were intermingled with those of *P. debilis* Walker only, the latter being much more numerous. Association of nymph and adult was established through rearing.

***Paraleptophlebia quisquilia* Day, new species**

(Plate IV, figures 6, 7)

Male imago (in alcohol)

Head: Pitchy dark brown with yellow median carina. Clypeus yellow hyaline with anterior edge black brown. Vertex with wide full-length median brown stripe. *Thorax*: Pronotum smoky marked with brown; anterior margin black. Mesonotum reddish black brown with black sutures and margins; somewhat paler before the scutellum. *Legs*: All coxae dark red brown with black pencilings. Fore femur and tibia pale red brown. Femora and tibiae of legs 2 and 3, palest yellow. All tarsi white. *Wings*: Vitreous. Long veins of forewing faintly marked with gray, those toward hind margin becoming paler. Subcosta of hindwing gray; all other veins of both wings pale. *Abdomen*: Tergites 2-7 hyaline yellow, thinly washed with black; dark, poorly marked triangles in antero-lateral areas; posterior margins each with a thin, sharp black line; from each postero-lateral corner a narrow black line extends forward above pleural fold a very short distance, then runs obliquely upward half way to anterior margin. Segments 8-10 same color as mid-sections, but opaque. Sternites 1-7 each with a pair of submedian oblique hyaline dashes

starting from anterior margins, and each with a pair of submedian hyaline small spots. *Tails*: Smoky yellow, narrowly darker at joinings. *Size*: Body 6.3 mm. long; forewing 7 mm.; tails 12 mm.; foreleg 6 mm.

Female imago (in alcohol)

Body: Color uniformly pale yellow brown, tergites very lightly surfaced with black. *Legs*: Foreleg pale yellow, femur faintly smoky and with black hair-lines extending almost full length of segment; one hair line central on anterior surface and the other marking the dorsal edge. Legs 2 and 3 white, tarsi smoky. Fore tarsus black, contrasting strongly with other leg segments. *Size*: Body 6.7 mm. long; forewing 7 mm.; tails 12 mm.

Nymph (in alcohol)

Head: Pale yellow with labrum and fronto-clypeal area dark red brown; area between ocelli and lateral margins widely dark. *Thorax*: Pale yellow, lightly washed with black. *Legs*: Pale, all segments light brown in the middle. Coxae largely light brown. Claws yellow, fore claw bearing 16 denticles. *Abdomen*: Tergites 2-7 with conspicuous small submedian pale areas at anterior margin; starting at the edge of these pale spots, a wide, curved dark stripe joins posterior margin just above postero-lateral corner; posterior margins of all tergites broadly dark. Tergites 8-10 pale with some dark markings. Sternites pale yellow with posterior margins faintly dark across the median section, these becoming strongly dark as they approach the lateral margins. Segments 8 and 9 bear postero-lateral spines. *Gills*: Broadly lanceolate, divided almost to the base. Tracheae black and without branchlets. *Tails*: Yellow, unmarked at joinings. *Size*: Body 6 mm. long; tails 9 mm.

Holotype: Male imago; collected on MIDDLE CREEK, LAKE COUNTY, CALIFORNIA, May 28, 1949; in collection of California Academy of Sciences. *Allotype*: Female imago; same data; in collection of California Academy of Sciences. *Paratypes*: Two ♂ imagoes, 3 ♀ imagoes and 4 nymphs in author's collection. Same data as holotype.

The association of nymph and adult was established through rearing.

This species is the smallest *Paraleptophlebia* found to date in California. Adult males cannot go beyond couplet 12 in Traver's key to the species of *Paraleptophlebia* (1935. Biology of Mayflies, p. 512), as the tails are not ringed at the base. However, the tails of *P. californica* Traver often lack rings at the base, and *P. quisquilia*, the new species, might be considered closest in relationship to *P. californica*; apart from the differences in maculation, the difference of form of the genitalia of the two species serve to separate them. The cleft between the penes of *P. californica* is notably deep and wide, while that of *P. quisquilia* is very small by comparison. The type locality is 4.5 miles upstream, by road, from the town of Upper Lake.

Ameletus imbellis Day, new species

(Plate V, figures 2, 5 and 5a)

Male imago (in alcohol)

Head: Face and clypeus black brown; median carina light brown; vertex pale. Ocelli milky white ringed with black at base. Compound eyes nearly contiguous; no oblique band across eyes, but lower portions darker gray and with smaller facets. *Thorax:* Pronotum black brown with wide anterior and fine posterior and lateral pale margins. Mesonotum yellow brown with extensive darker lateral areas; anterior portion, scutellum and median suture, dark brown; two pale dots before the scutellum. Metanotum pale brown. Pleural sutures white; sclerites red brown; a wide black line runs obliquely downward from root of forewing. Sternum darker red brown than sclerites of pleuron. *Legs:* All coxae pale brown, with dark brown markings; narrowly margined with black. Fore trochanter and femur dark brown. Fore tibia and tarsus pale brown. Middle and hind legs pale yellow; joinings of tarsi narrowly black. *Wings:* Faintly milky, strongly so in stigmatic area of forewing. All veins in both wings medium brown, a few crossveins of forewing lightly clouded with brown; humeral brace dark brown. *Abdomen:* Segments 1, 8, 9 and 10 opaque dark brown. Segments 2 and posterior half of 7, translucent medium brown. Tergites 3-6 are hyaline white with thin, broad dark brown surfacing in median and posterior areas; posterior margins widely pale. Sternites 2-7 hyaline yellow white with faint indications of darkened ganglia; on sternite 2, a pair of large dark brown median spots near anterior margin. *Genitalia:* Stimuli sharp and fine. Second joint of forceps bent strongly inward near base. *Tails:* Light brown, joinings pale. *Size:* Body 12 mm. long; forewing 11 mm.; tails 15 mm.; foreleg 10.5 mm.

Female imago (in alcohol)

Description: Considerably darker than male imago. Notum concolorous dark brown. Tergites patterned as in male; dark areas more extensive and purple in tone. Sternites 2-7 hyaline pale purple-rose. Ovipositor very prominent and black in middle. Wing veins thicker and darker than in male imago; crossveins more heavily clouded; humeral brace black brown. *Size:* Body 10 mm. long; forewing 10.5 mm.; tails 14 mm.

Nymph

Features of the nymph that can be determined from the cast skin show tails widely banded with dark in the middle area. Gills with short chitinous band about one-quarter distant from the dorsal edge.

Holotype: Male imago; collected on SAGE CREEK, NAPA COUNTY, CALIFORNIA, April 4, 1950; in collection of California Academy of Sciences. *Allotype:* Female imago; same data; in collection of California Academy of Sciences. *Paratypes:* 3 ♂ imagoes from Sage Creek April 4, 1950; 10 ♂ imagoes and 8 ♀ imagoes from Sage Creek, March 18, 1951; 5 ♂ imagoes and 7 ♀ imagoes from Little Stoney Creek, Colusa County, California, April 21, 1951; 1 ♂ imago; 1 ♀ imago; 1 nymph in collection of G. F. Edmunds, Jr.; others in author's collection.

This species is very close to *A. amador* Mayo, but can be distinguished from the latter by the much sharper inward bend of the second segment of the forceps. The holotype of *A. amador* and 3 additional paratype ♂ imagoes loaned by Dr. Mayo show the second segment of the forceps to be smoothly and evenly curved exactly as illustrated in her paper (1939:151). The appearance of the sharp inward bend of the second segment of the forceps of *A. imbellis* is constant in 20 ♂ imagoes collected from two different locations in two separate years.

***Ameletus facilis* Day, new species**

(Plate V, Figures 6 and 6a)

Male imago (in alcohol)

Head: Velvety black brown with small pale spot before lateral ocelli and fine white circular line around antennal sclerite; narrow pale line on upper edge of median carina. Compound eyes dark gray, darker in lower portion and contiguous above. *Thorax*: Pronotum velvety black brown with fine white line on posterior margin and small white areas in postero-lateral corners. Mesonotum pale yellow brown with dark shading laterally and in postero-lateral areas; scutellum yellow brown narrowly margined with black brown; post-scutellum dark brown. Metanotal scutellum as in mesonotum. *Legs*: Foreleg dark brown; tarsus only a shade lighter than other joints. Legs 2 and 3 pale yellow; coxae pale, widely marked with brown and edged with black; coxal processes mostly dark brown. *Wings*: Vitreous. Stigmatic area of forewing strongly brown tinted. Brown spot at base of forewing. All veins of both wings amber; humeral braces amber. *Abdomen*: Segments 1, 8, 9 and 10 opaque brown. Tergites 2-7 semi-hyaline palest cream with smoky areas on posterior third, somewhat darker in postero-lateral corners. Tergite 2 almost entirely pale, with following tergites progressively more broadly darkened, 7 being almost entirely dark brown. Sternites 2-7 semi-hyaline white with opaque white ganglionic areas. Short, faint central submedian brown dashes on sternites 1 and 2. *Tails*: Pale yellow brown, the paler joinings of each section narrowly margined with dark brown. *Size*: Body 10.5 mm. long; forewing 10.5 mm.; tails 14 mm.; foreleg 9 mm.

Holotype: Male imago; collected on SAGE CREEK, NAPA COUNTY, CALIFORNIA, April 22, 1950; in collection of California Academy of Sciences. *Allotype*: Female imago; collected on Smith Creek, Santa Clara County, California, April 7, 1951; in collection of California Academy of Sciences. *Paratypes*: 1 ♂ imago and 1 ♀ imago, same data as holotype, in collection of California Academy of Sciences; 1 ♂ imago, 1 ♀ imago, 1 nymph, same data as holotype, in collection of G. F. Edmunds, Jr.; 10 ♂ imagoes and 9 ♀ imagoes from Smith Creek, April 7, 1951, in author's collection. Males key to *Ameletus* (1935:447), and *A. facilis*, n. sp. is closely related to

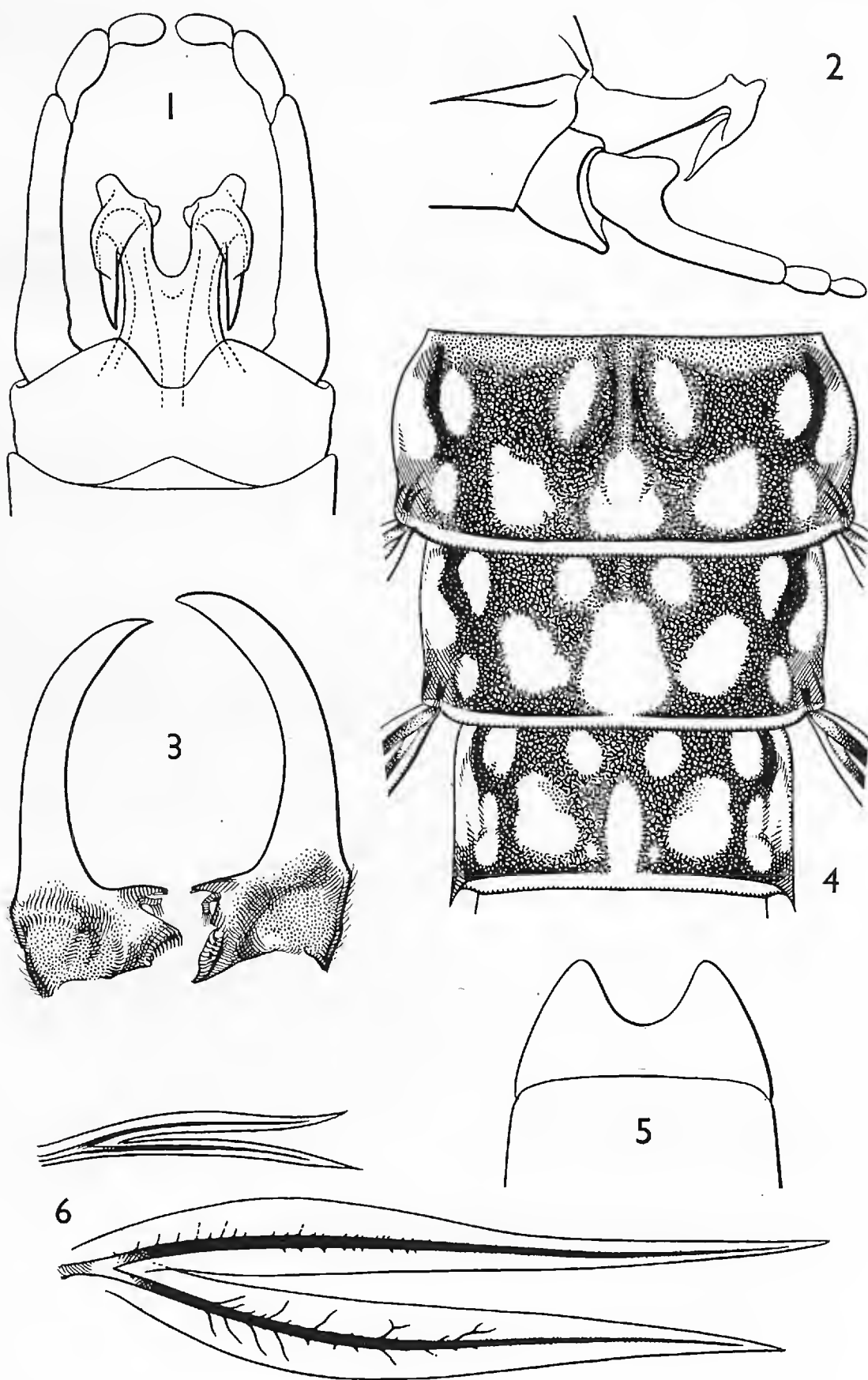
PLATE I, *Paraleptophlebia helena*

Fig. 1 genitalia, ventral aspect. Fig. 2 genitalia, lateral aspect. Fig. 3 mandibles of nymph. Fig. 4 tergites of nymph, 6, 7 and 8. Fig. 5 subanal plate, female imago. Fig. 6 gills of nymph, 1 and 4.

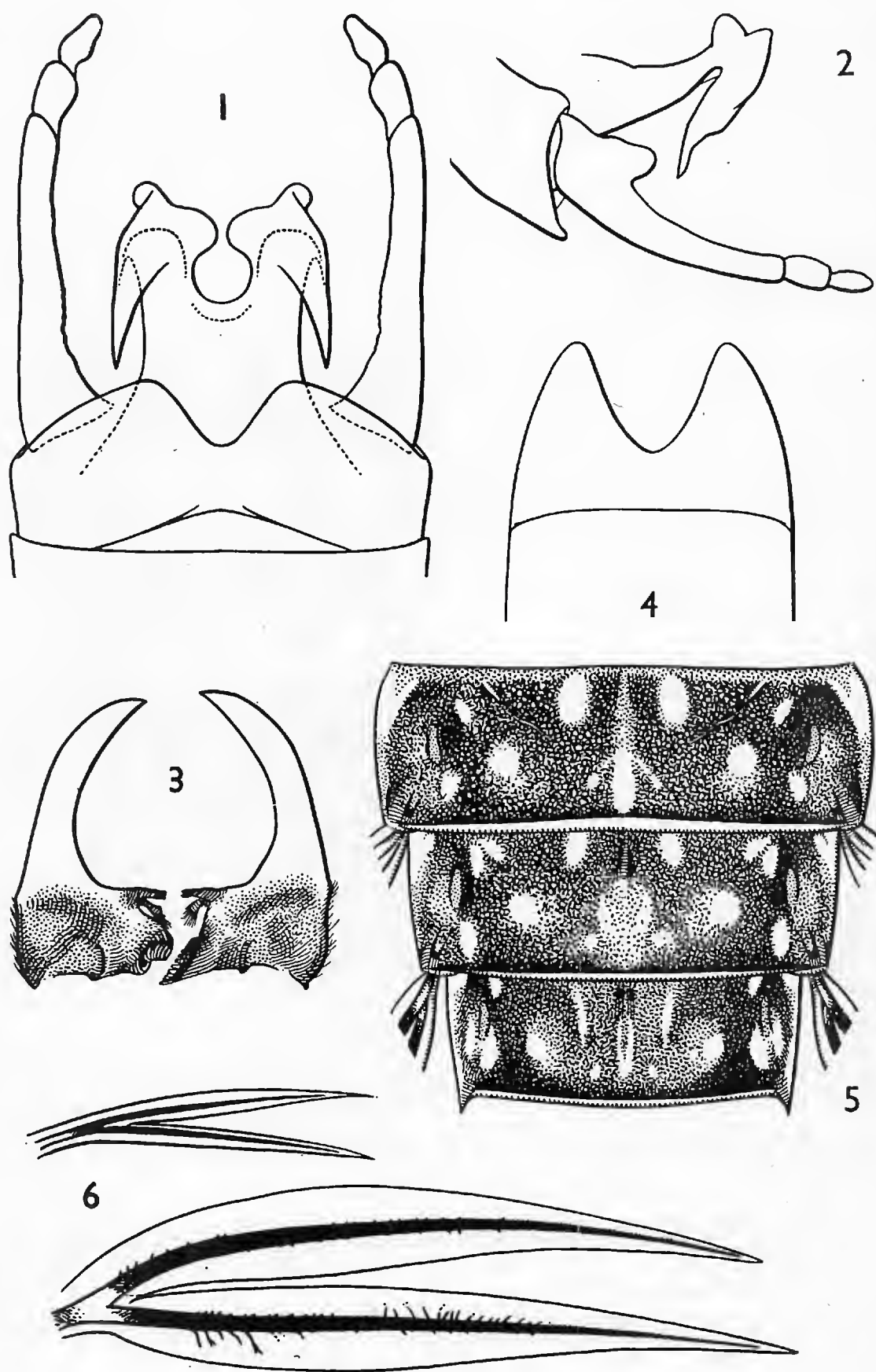
PLATE II, *Paraleptophlebia zayante*

Fig. 1 genitalia, ventral aspect. Fig. 2 genitalia, lateral aspect. Fig. 3 mandibles of nymph. Fig. 4 subanal plate, female imago. Fig. 5 tergites of nymph, 6, 7 and 8. Fig. 6 gills of nymph, 1 and 4.

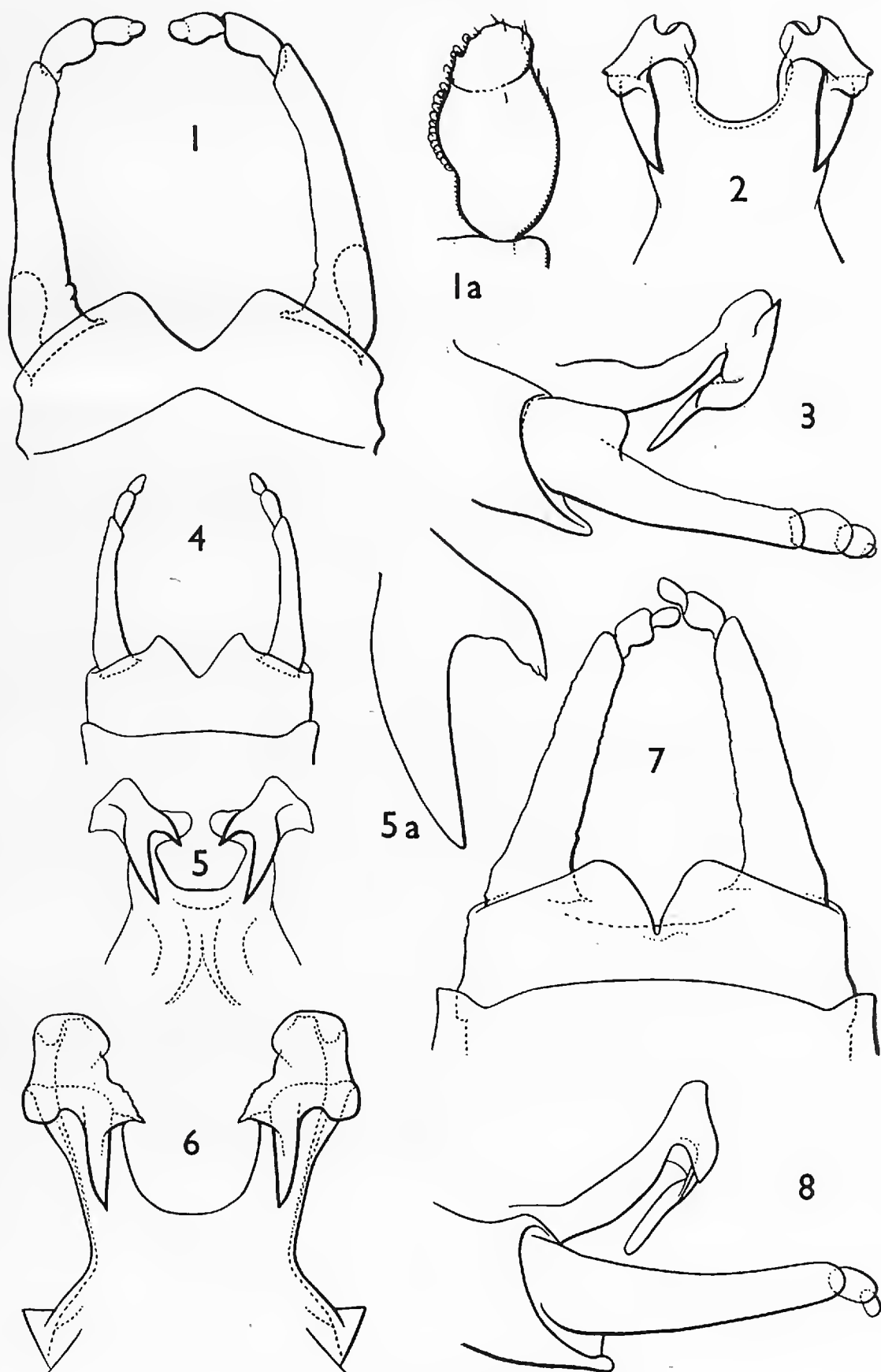
PLATE III, Genus *Paraleptophlebia*

Fig. 1 *P. packii*, forceps, ventral aspect. Fig. 1a *P. packii*, terminal joint of forceps. Fig. 2 *P. packii*, penes, ventral aspect. Fig. 3 *P. packii*, genitalia, lateral aspect. Fig. 4 *P. bicornuta*, forceps, ventral aspect. Fig. 5 *P. bicornuta*, penes, ventral aspect. Fig. 5a *P. bicornuta*, reflex spur. Fig. 6 *P. californica*, penes, ventral aspect. Fig. 7 *P. californica*, forceps, ventral aspect. Fig. 8 *P. californica*, genitalia, lateral aspect.

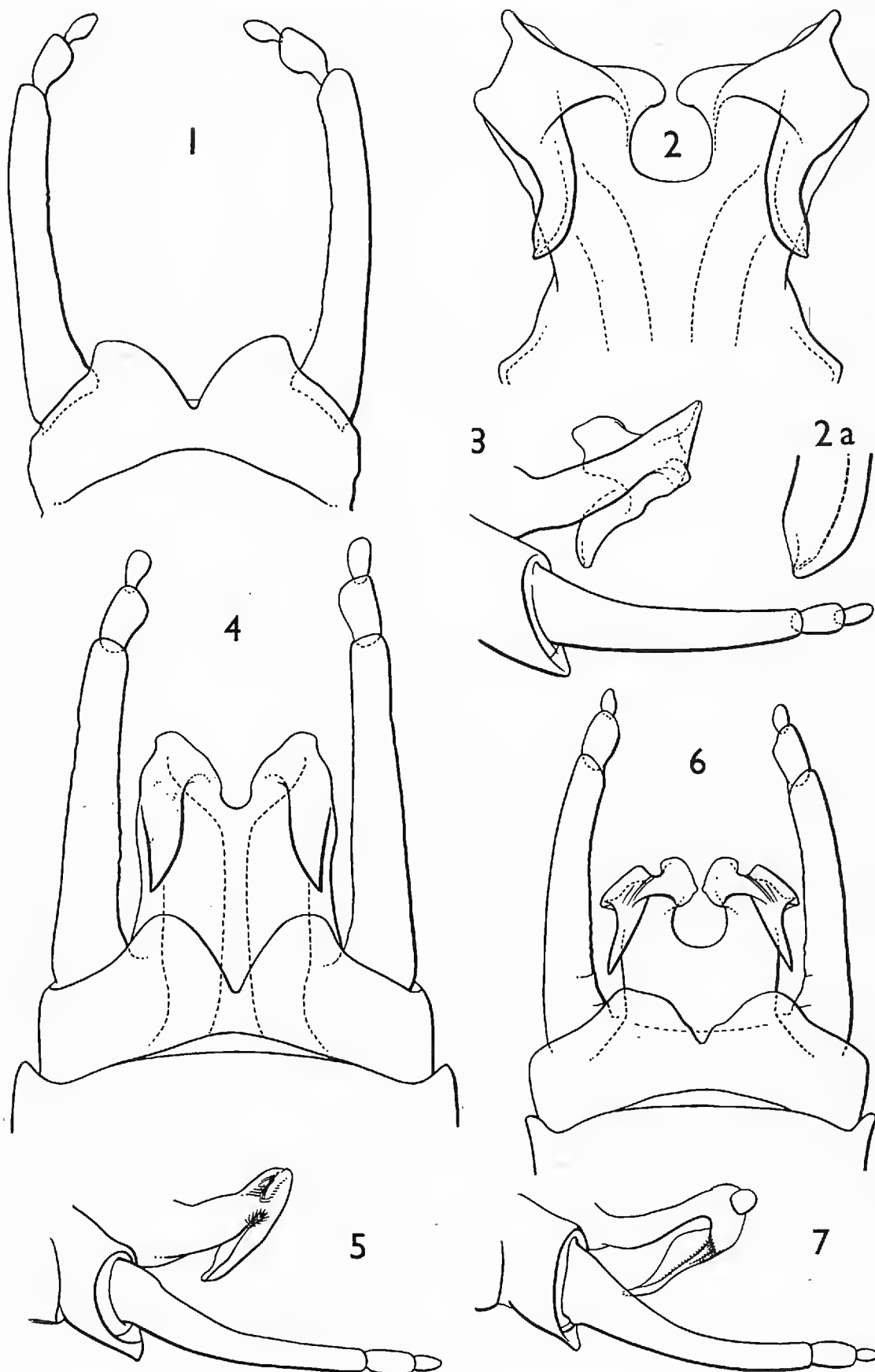


PLATE IV, Genus *Paraleptophlebia*

Fig. 1 *P. associata*, forceps, ventral aspect. Fig. 2 *P. associata*, penes, ventral aspect. Fig. 2a *P. associata*, tip of reflex spur. Fig. 3 *P. associata*, genitalia, lateral aspect. Fig. 4 *P. genitalia*, ventral aspect. Fig. 5 *P. clara*, genitalia, lateral aspect. Fig. 6 *P. quisquilia*, genitalia, ventral aspect. Fig. 7 *P. quisquilia*, genitalia, lateral aspect.

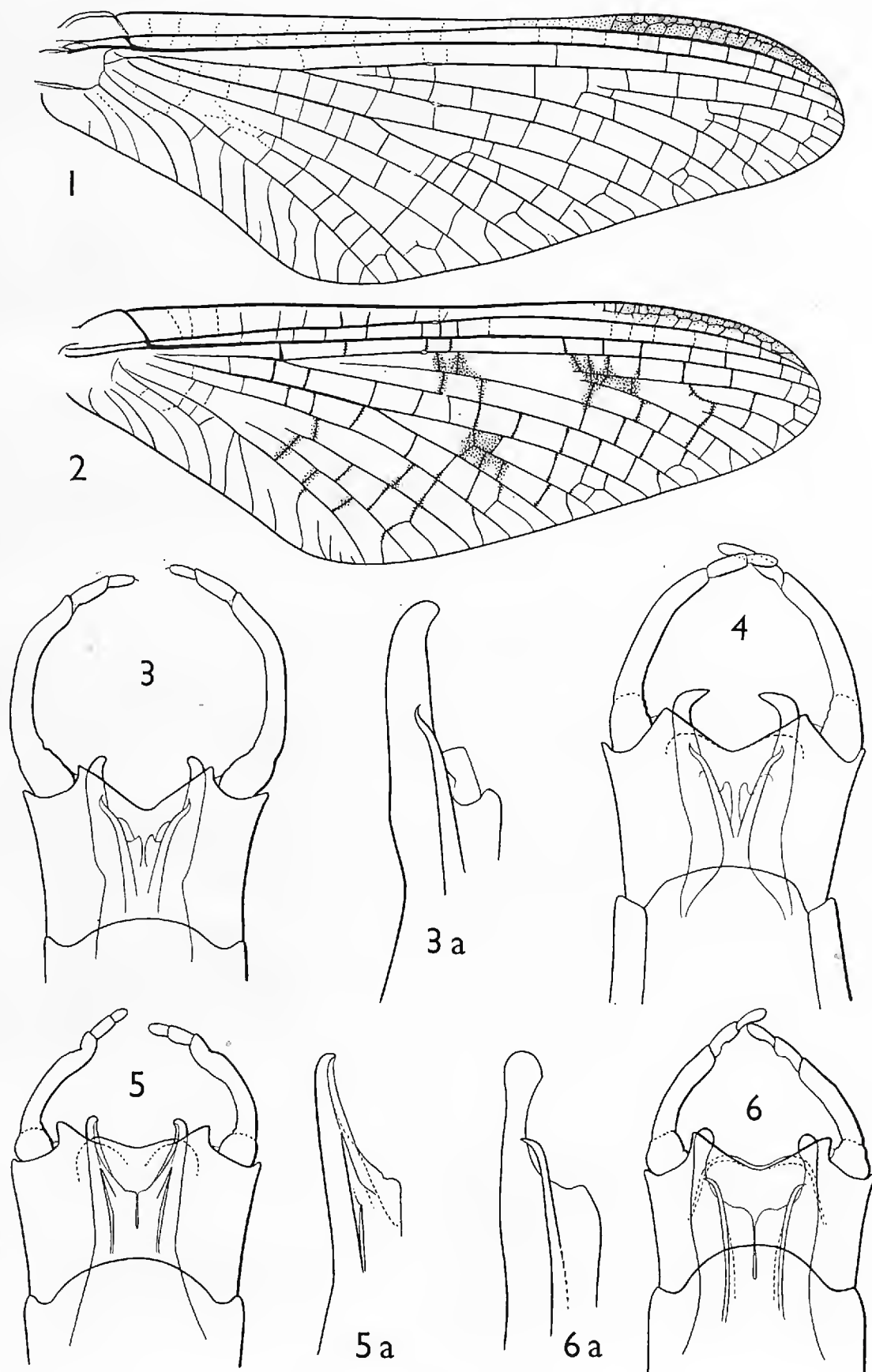
PLATE V, Genus *Ameletus*

Fig. 1 *A. dissitus*, forewing, male imago. Fig. 2 *A. imbellis*, forewing, male imago. Fig. 3 *A. dissitus*, genitalia, ventral aspect. Fig. 3a *A. dissitus*, penes, lateral aspect. Fig. 4 *A. dissitus*, genitalia, ventral aspect, showing distorted penes. Fig. 5 *A. imbellis*, genitalia, ventral aspect. Fig. 5a *A. imbellis*, left half of penes, ventral aspect. Fig. 6 *A. facilis*, genitalia, ventral aspect. Fig. 6a *A. facilis*, left half of penes, ventral aspect.

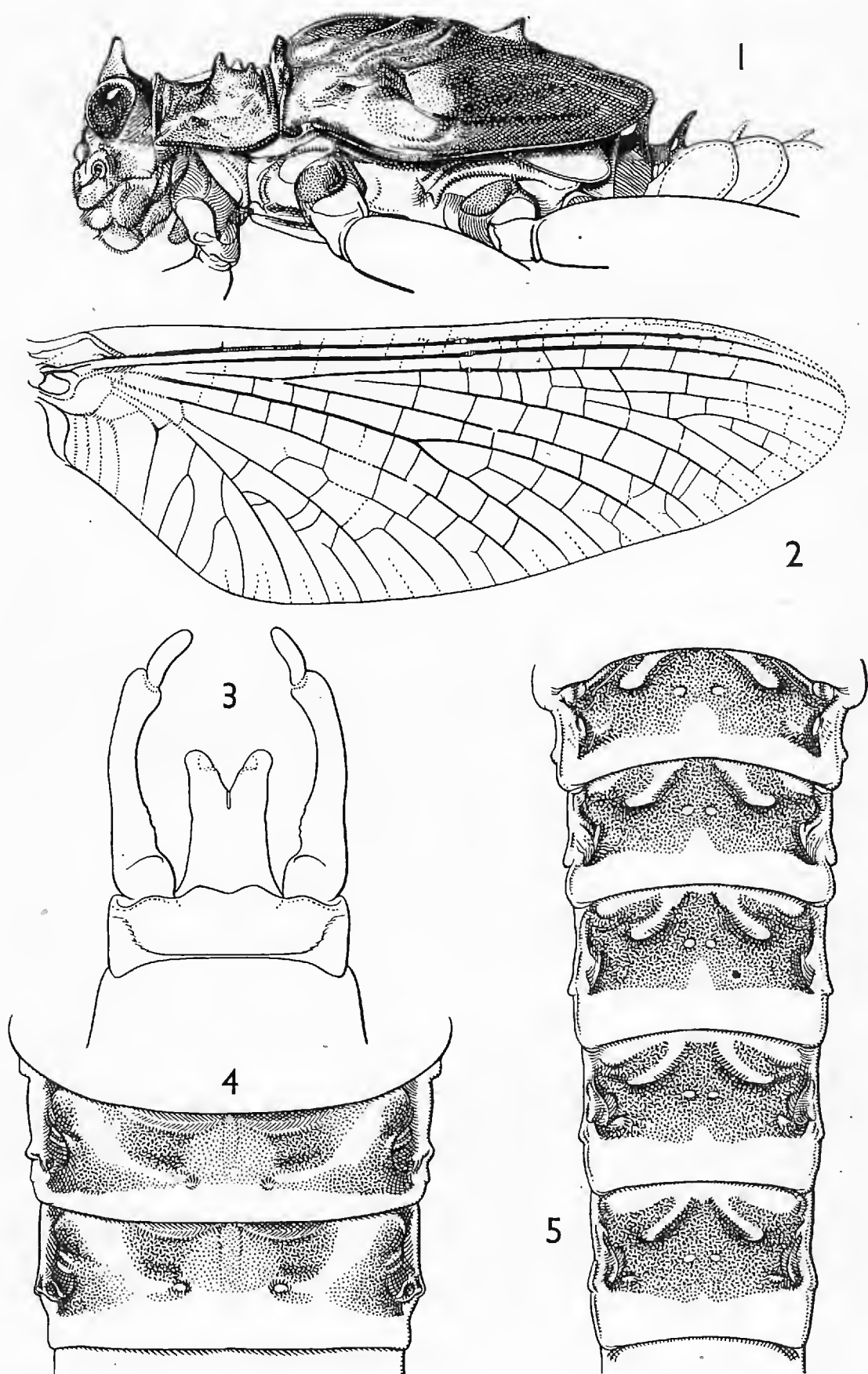
PLATE VI, *Ephemerella glacialis carsona*

Fig. 1 nymph, head and thorax, lateral aspect. Fig. 2 forewing, male imago. Fig. 3 genitalia, ventral aspect. Fig. 4 tergites of male imago, 2 and 3. Fig. 5 sternites of male imago, 2, 3, 4, 5 and 6.

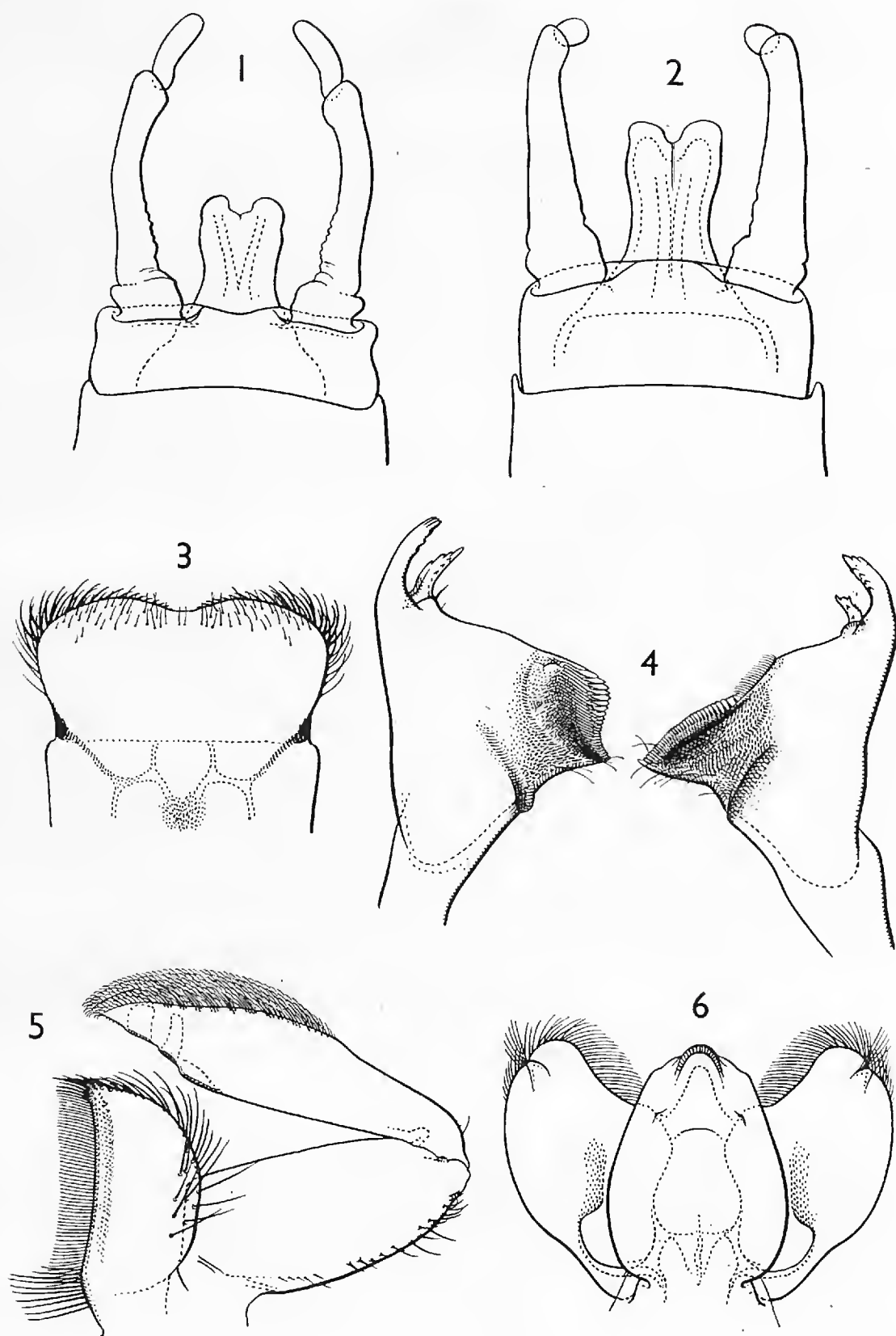


PLATE VII

Fig. 1 *Ephemerella spinifera*, genitalia, ventral aspect. Fig. 2 *Ephemerella cognata*, genitalia, ventral aspect. Fig. 3 *Ironodes lepidus*, labrum of nymph. Fig. 4 *Ironodes lepidus*, mandibles of nymph. Fig. 5 *Ironodes lepidus*, maxilla of nymph. Fig. 6 *Ironodes lepidus*, hypopharynx of nymph.

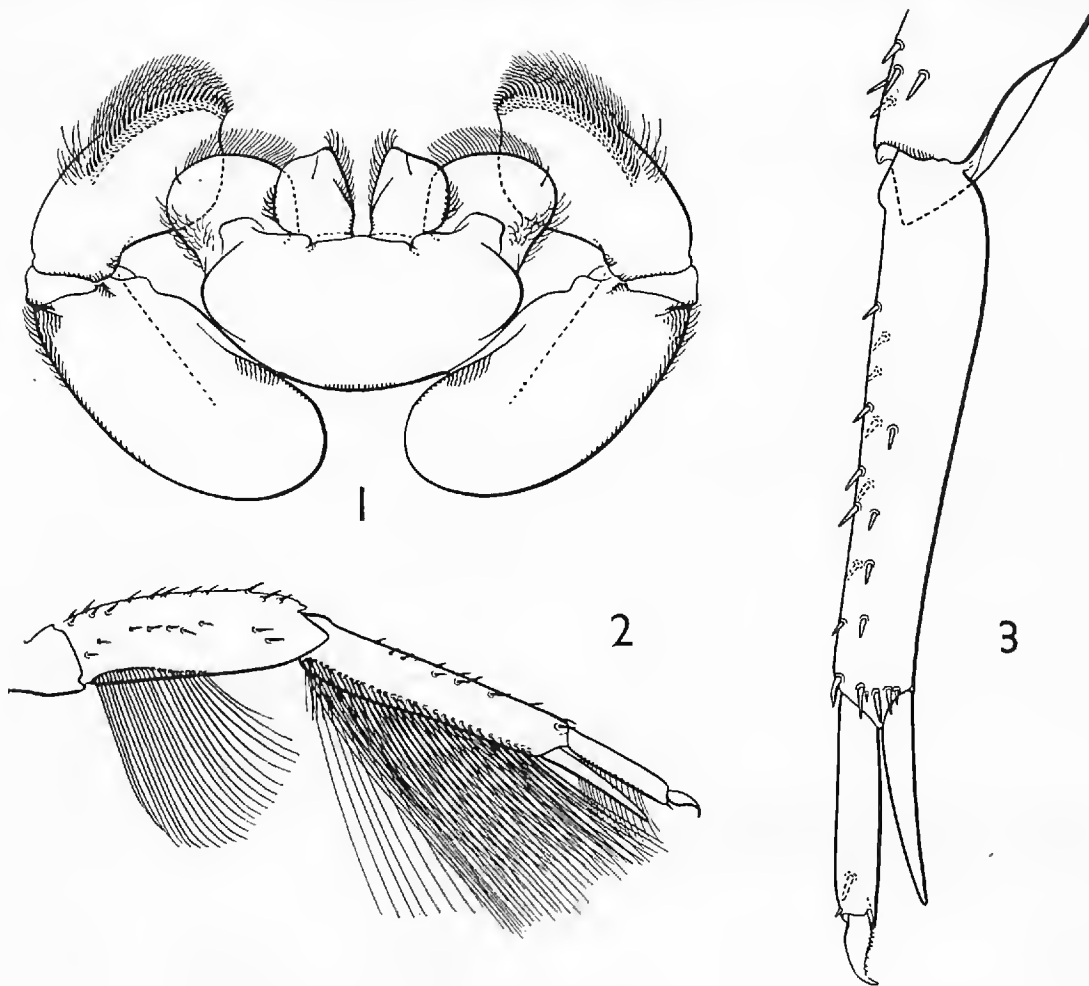


PLATE VIII

Fig. 1 *Ironodes lepidus*, labium of nymph. Fig. 2 *Isonychia velma*, foreleg of nymph. Fig. 3 *Isonychia velma*, fore tibia and tarsus of nymph.

A. aequivocus McDunnough. From the latter species, *A. facilis* may be distinguished by details of the genitalia. Comparatively, the penes of *A. facilis* are widely separated and clubbed at the apices; the stimuli are bent outward at right angles at the tips.

Ephemerella glacialis carsona Day, new subspecies

(Plate VI)

Male imago (in alcohol)

Head: Dark yellow brown with black spots in front of compound eyes; a fine pale median line on vertex bordered on each side by narrow black lines; ridge of median carina black. Clypeus hyaline brown, emarginated with deep V-shaped notch at center. Light brown antennae set in white circles at base. Ocelli milky white, black at bases. Eyes nearly contiguous, upper portion pale yellow and lower portion black. *Thorax*: Pronotum dark yellow brown with median raised ridge finely black. A thin black lateral ridge halfway between margins extends almost entirely across the breadth of the segment. Mesonotum red brown, paler on sides; scutellum edged with black, with narrow median double black line extending forward from tip, and large median pale area anterior to end of this double line. Pleural sclerites dark brown, unsclerotized portions widely pale yellow. Sternum somewhat darker red brown than mesonotum. *Legs*: Foreleg red brown, basal third

of femur and tarsus paler. Middle and hind legs creamy, apical halves of femora ruddy brown. All coxae creamy with limited brown markings, each coxa reinforced strongly with a high, chitinous ridge extending its full length. Fore trochanter brown, others pale. *Wings*: Hyaline. Stigmatic area of forewing clouded and faintly brown. Wing veins strong red brown except that the crossveins between Costa and R_1 are entirely pale, with those in the apical quarter of the forewing faintly brown in this narrow strip. The intercalaries of the forewing are pale brown and those of the hindwing mostly colorless. Long veins of the forewing are pale at the base, as is the costal vein of the hindwing. Crossveins of stigmatic area of forewing irregularly anastomosed. *Abdomen*: Deep ruddy widely marked with creamy white, sternites slightly darker. A wide creamy line extends the full length of the pleural fold. Wide creamy posterior margins of each segment give the abdomen a strongly marked annulate appearance. Tergites 1-8 have similar patterns, and are as shown in Plate VI, fig. 4. Tergite 9 ruddy with pale lateral and posterior margins. Sternites as shown in Plate VI, fig. 5. *Genitalia*: Styliiger plate, penes and first two joints of forceps blackish brown with apical joint paler. *Tails*: Deep ruddy brown at base, paling to white at tips; joinings darker in dark portion only. *Size*: Body 18 mm. long; forewing 18 mm.; tails 21 mm.; foreleg 13 mm. Percentage of parts to total length of foreleg: femur, 29.3; tibia, 33.2; T_1 12.2; T_2 12.2; T_3 8.8; T_4 4.3.

Nymph (in alcohol)

Head: No frontal shelf. Five low, rounded tubercles on face, two below and three between the antennae. Wide, raised median carina, crossed in middle by another ridge. Occipital tubercles prominent, tapering to a blunt point. *Thorax*: Prothorax mottled black brown. Submedian tubercles, three on each side arranged as follows: the anterior tubercle is high and blunt; the posterior pair are small and unequal, the median being lower and set somewhat further forward. The submarginal tubercles, one on each side, are about two-thirds as high as the anterior submedian tubercles, but much finer. At the antero-lateral corner, a small marginal spine. Mesonotum mottled black brown. A short distance behind the anterior margin a narrow, low ridge extends from median line to antero-lateral corner; on this ridge and just below the median line is a small tubercle; on same ridge, a small tubercle is halfway distant from median to lateral margin. The principal mesonotal submedian tubercles arise from long, low, well-formed ridges, one on each side. The ridge is higher and much better defined than in *E. grandis* Eaton, and lower than in *E. glacialis glacialis* Traver. The tubercle arising from the ridge varies from one-third to one-half the height of a well developed tubercle of *E. g. glacialis*. The median posterior tubercle is larger than in *E. g. glacialis*. *Legs*: Femora dark red brown, unmodified by teeth or spines, and somewhat flattened. Tibiae red brown with dark band in center. Tarsi black in proximal portion. Claws black and with 7-8 spines. *Abdomen*: Lateral spines well developed on segments 4-9; much smaller on 3 and lacking on 2. Gills on segments 3-7. Dorsal spines very prominent; smallest and closest together on 2, larger and further apart on 3, higher and in parallel lines on 4-7; all incurved and backward bent at tips. Spines on 8 and 9 are heavier and 40% longer than those of 4-7; those on segment 8 are stouter than 9, and beset

with a few long hairs. Sternites blackish brown with vague wide pale median stripe on 1-8, and short black submedian dashes from anterior margin, and curved black dashes near lateral margins. *Tails*: Alternately black brown and yellow. *Size*: Body, 18 mm. long; tails, 12 mm.

Holotype: Male imago; reared from nymph collected by Helen L. Day at HANGMANS BRIDGE, EAST FORK CARSON RIVER, ALPINE COUNTY, CALIFORNIA, July 3, 1950; in collection of California Academy of Sciences, together with nymphal shuck. *Paratypes*: 1 nymph at California Academy of Sciences; 1 ♂ imago and 1 nymph in collection of George F. Edmunds, Jr.; 12 nymphs in author's collection; all topotypical.

The nymph is dull black brown, sometimes with wide pale median stripe from vextex to tergite 10. While this subspecies may prove to be only a variation of typical *E. glacialis* Traver, the adult of the latter is unknown, and comparisons of the nymphs with all the specimens of typical *E. glacialis* in the Cornell University collection show consistent differences in the height of the mesonotal tubercles. There is some difference in the height of the mesonotal tubercles in the Cornell specimens, as is true with the Carson River nymphs, but the range and the average height of the latter is much lower. Mr. George F. Edmunds, Jr., of the University of Utah has examined the material and has concurred with my belief that this should be named as a subspecies of *E. glacialis*.

The type locality of *E. glacialis* is given as Glacier National Park, Montana, and Eaton's Nymph No. 2, Revis. Monogr., p. 131, which is probably the same species, was described from Washington; this species has not been reported elsewhere. It appears that sufficient physical separation exists between *E. glacialis glacialis* and *E. glacialis carsona* to permit the subspeciation indicated.

WESTERN *Paraleptophlebia* HAVING NYMPHS WITH TUSKED MANDIBLES

For comparison with *P. zayante* and *P. helena*, described above, George F. Edmunds, Jr., of the University of Utah very kindly presented me with adult and nymphal specimens of *P. packii* Needham and *P. bicornuta* McDunnough. Genitalia drawings of these two longer-known species are given. Plate III, figures 1, 1a, 2, 3, 4, 5 and 5a.

PARALEPTOPHLEBIA CALIFORNICA Traver

(Plate III, figures 6, 7 and 8)

Paraleptophlebia californica Traver, 1934. Jour. Elisha Mitchell Sci. Soc. 50:195.

After examining the type material from Cornell University collection, and with additional material available, new genitalia drawings are given herewith as an aid to the identification of this species.

PARALEPTOPHLEBIA ASSOCIATA McDunnough

(Plate IV, figures 1, 2, 2a and 3)

Leptophlebia associata McDunnough, 1924. Canad. Ent. 56:221.

Paraleptophlebia compar Traver, 1934. Jour. Elisha Mitchell Sci. Soc. 50:193.

The writer has examined the paratype genitalia slide of *Paraleptophlebia associata* McDunnough No. 818 in the Canadian National Collection, referred to by Dr. James McDunnough (1924: 221) and has examined the types and paratypes of *Paraleptophlebia compar* Traver in the Cornell University collection, and believes that only one species is involved. *Leptophlebia associata* was transferred to *Paraleptophlebia* by Dr. J. R. Traver in 1934. It is the writer's belief that *P. compar* is a synonym of *P. associata*. The species is very widespread in northern California, having been collected by the author in Plumas, Alpine, Sonoma, Napa, Alameda, San Mateo, Stanislaus and Contra Costa counties, and on Waddell Creek, Santa Cruz County, the type locality of *P. compar*.

The coloration of this species, like others of this genus in California, varies considerably in fresh specimens taken from different streams, so the details of coloration are of dubious value in descriptions for species with any considerable distribution.

In the species under discussion, the reflex spurs of the penes are sometimes bent ventrally very sharply, causing them to appear quite short when viewed from below; there is considerable variation as to degree of lateral bending, the more sharply bent appearing shorter. The reflex spurs of the penes mounted on Slide 818 of the Canadian National Collection are bent ventrally and laterally quite strongly.

The published drawing of Slide 818 above referred to does not show the true appearance of the penes or spurs mounted on this slide. One important detail omitted is an easily seen "tuck" that produces a small protuberance at the end of each reflex spur. This protuberance is seen on Slide 818, all specimens from Cornell University, and all specimens collected by the present writer; it is shown on Plate IV, figs. 2 and 2a of this paper.

PARALEPTOPHLEBIA CLARA McDunnough

(Plate IV, figures 4 and 5)

Leptophlebia clara McDunnough, 1933, *Canad. Ent.* 65:155.

After examining a paratype of this species from the Canadian National Collection, and with additional material of the writer's collecting available, new genitalia drawings are given herewith as an aid to identification. When the penes is cleared and mounted, the large seminal ducts are very prominent and distinctive, and are seen to be a strong dark purple. The male imago has been found to be highly variable in color.

AMELETUS DISSITUS Eaton

(Plate V, figures 1, 3, 3a and 4)

Ameletus dissitus Eaton, 1885. *Trans. Linn. Soc. London, Sec. Ser. Zool.* 3:210.

On March 24, 1950, male imagoes of *Ameletus dissitus* Eaton were collected on Sage Creek, Napa County, California. The identification was made positive through the kindness of Mr. D. E. Kimmins of the British Museum (Natural History), who compared two genitalia slides from the writer's collection with the mounted genitalia of Eaton's paralectotype of *A. dissitus*. One important feature of the genitalia of this species has not been detailed in some prior drawings, and is shown on Plate V, figs. 3 and 3a; the apical ends of the stimuli are formed into sharp hooks which are easily seen and quite distinctive.

On Plate V, fig. 4, there is shown another specimen of *A. dissitus* with the apical ends of the penes fixed in a different position at the time of death; this example was collected at the same time and place as those referred to above.

EPHEMERELLA SPINIFERA Needham

(Plate VII, figure 1)

Ephemerella spinifera Needham, 1927. *Ann. Ent. Soc. Amer.* 20:110.

The undescribed male adult of this species has been reared from nymphs taken from the East Fork of the Carson River, near Hangmans Bridge, Alpine County, California, July 4, 1949. Description of the male imago (in alcohol) is as follows:

Head: Pale yellow; median portion of face beside the median carina, and median portion of clypeus darker. Eyes light orange brown in upper portion with lower portion black. *Thorax*: Pronotum yellow brown with narrow median and lateral lines purplish-black. Mesonotum brown yellow, a somewhat darker and very wide stripe along entire median area; narrowly purple black on postero-lateral margins. Wide white bands above base of fore coxae. Basisternum of prothorax light yellow, marked with strong purple brown curved lines along antero-lateral margin and across posterior margin. Basisternum of

mesothorax white; furcisternum dark red brown with white sutures. *Legs*: All femora white at base, graduating to deep purple rose apically. Fore tibiae pink. All other leg segments white. Tarsi faintly marked with smoky. *Wings*: Faintly milky, strongly so along the costal strip. All veins dark red brown; humeral brace milky white. *Abdomen*: Tergites bright purple rose, anterior median portions pale. Tergites 4-10 with posterior margins white; marked with fine median broken black line. A wide white stripe extends full length of abdomen along pleural fold; postero-lateral corners of all tergites white. Sternites same shade as tergites; posterior margins widely white. Sternites 2-9 each with a pair of pale curved submedian dashes based on anterior margin; each sternite with a pair of small pale submedian spots mid-distant between anterior and posterior margins. *Genitalia*: Forceps purple rose. Penes black brown. *Tails*: Dark purple brown at base, lightening to white apically; joinings dark red purple. *Size*: Body 13 mm. long; forewing 15 mm.; tails 16 mm.; foreleg 12.5 mm.

EPHEMERELLA COGNATA Traver

(Plate VII, figure 2)

Ephemerella cognata Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:231.

The undescribed adult male of this species has been reared from nymphs taken from San Gregorio Creek, San Mateo County, June 17, 1950; from Sage Creek in Napa County; from Sonoma Creek in Sonoma County and from Waddell Creek in Santa Cruz County, the latter being the type locality. All counties named are in California. Description of the male adult (in alcohol) is as follows:

Head: Blackish-brown with pale median line on vertex; clypeus and nasal carina hyaline yellow. Antennal sclerite white. *Thorax*: Pronotum, mesonotum and sternum blackish-brown. Pleural sutures paler. *Legs*: Foreleg medium brown. Middle and hind legs white, the apices of the tibiae sometimes faintly brown. *Wings*: Faintly milky, strongly so in stigmatic areas; dark brown areas at bases of wings. A long axial cord is present as in *Ephemerella tibialis* McDunnough; this cord extends almost to tip of scutellum and then projects backward .3 mm. beyond the scutellum. All veins are colorless; so completely vitreous that they are easily seen against the slight milkiness of the wings. *Abdomen*: Segments 2-7 semi-hyaline yellow green. Dorsum and sternum concolorous. Tergites with dark posterior margins, broadest in median area; fine, broken, double, dark median stripe. Sternites show ganglionic areas as white opaque and/or hyaline; small dark spots near antero-lateral corners. *Genitalia*: As shown on Plate VII, fig. 2. *Tails*: Clear hyaline white, narrowly marked with brownish red at each joining. *Size*: Body 7 mm. long; forewing 8 mm.; tails 9 mm.; foreleg 7.5 mm.

IRONODES LEPIDUS Traver

(Plate VII, figures 3, 4, 5 and 6; Plate VIII, figure 1)

Ironodes lepidus Traver, 1935. Canad. Ent. 67:35.

The undescribed nymph of this species has been associated with

the male adult through rearing, and drawings of nymphal mouth-parts are given that may be helpful in the further study of this genus. Nymphs were collected on a small tributary of Hamilton Branch, North Fork of Feather River, Plumas County, California, on May 29, 1950.

In alcohol, the entire dorsum of this nymph is dark red brown. Before each ocellus, a pale yellow spot. On the pronotum, a fine, dark raised ridge extends nearly the full width across; it is parallel to and one-third the length of the pronotum behind the anterior margin. Mesonotum vaguely marbled with lighter brown. Basisternum of prothorax outlined in dark brown on lateral and posterior margins; a small yellow brown central area. Median area of mesosternum and metasternum yellow brown; all other surfaces of sternum white. On well marked specimens, a small pale spot at the base of each submedian abdominal spine. Sternites yellow brown with dark brown lateral streaks; a pair of pale submedian oblique dashes arise from anterior margin on each sternite. Lamellate portions of gills dark red brown with central portion white to base; fibrilliform portions lavender; tracheae of gills not visible in reflected light. Legs dark red brown with black brown tarsi narrowly banded with yellow at proximal end. Anterior surfaces of femora with white area in middle, and white line extending to base; posterior surfaces with wide white stripe from base almost to apical end.

The nymphs of *I. lepidus* were found only in very fast water. Emerging at 2:00 p.m. on Hamilton Branch tributary, they crawled almost out of water on rough rock, waited for from 3 to 5 minutes, broke out of the nymphal skin, crawled to a dry portion of rock and dried the wings for up to 9 minutes before flying to low branches at the water's edge.

ISONYCHIA VELMA Needham

(Plate VIII, figures 2 and 3)

Isonychia velma Needham, 1932. Canad. Ent. 64:273.

The undescribed nymph has been associated with the male adult through rearing. This species is very widespread in northern California, found to date in large rivers such as the Klamath, Trinity, Russian, and Putah Creek. It has been found always in shallow, fast riffles, frequently on wood. The body of the mature nymph is as long as 20 mm. The description of the nymph follows:

Entire body an even tone of darkest yellow brown; head almost black. Basal segment of antennae very dark, as is pedicel; flagellum dark at base, paling apically. Tergites with faint, narrow pale median stripe in anterior halves; this stripe is paralleled by a submedian pale stripe on each side. Tergites and sternites with fine black lateral margins and finest black posterior margins; latter beset with fine, short spinules. Sternites with short, pale oblique streaks based on median point of anterior margin; just beyond the posterior ends of these, a series of four small pale spots, two on each side, are in line across the sternite. Gills pale gray brown with wide chitinous ridge along lower edge; an interior band of chitin across the gill one-third distant below the dorsal edge. Fore femur dark brown with wide pale apical band, and pale area in middle. Fore tibia pale with wide dark band toward proximal end. Fore tarsus black brown in proximal half and pale apically. Claws pale with small black tips. Spur at apical end of fore tibia varies from two-thirds to full length of fore tarsus; 16-20 spines on each fore tibia; 8-9 teeth on fore claw, irregularly spaced.

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A NEW SPECIES OF NITIDULID BEETLE FROM CHILE

(Coleoptera)

L. R. GILLOGLY

*State Department of Agriculture, Sacramento, California****Eumystrops chilensis* Gillogly, new species**

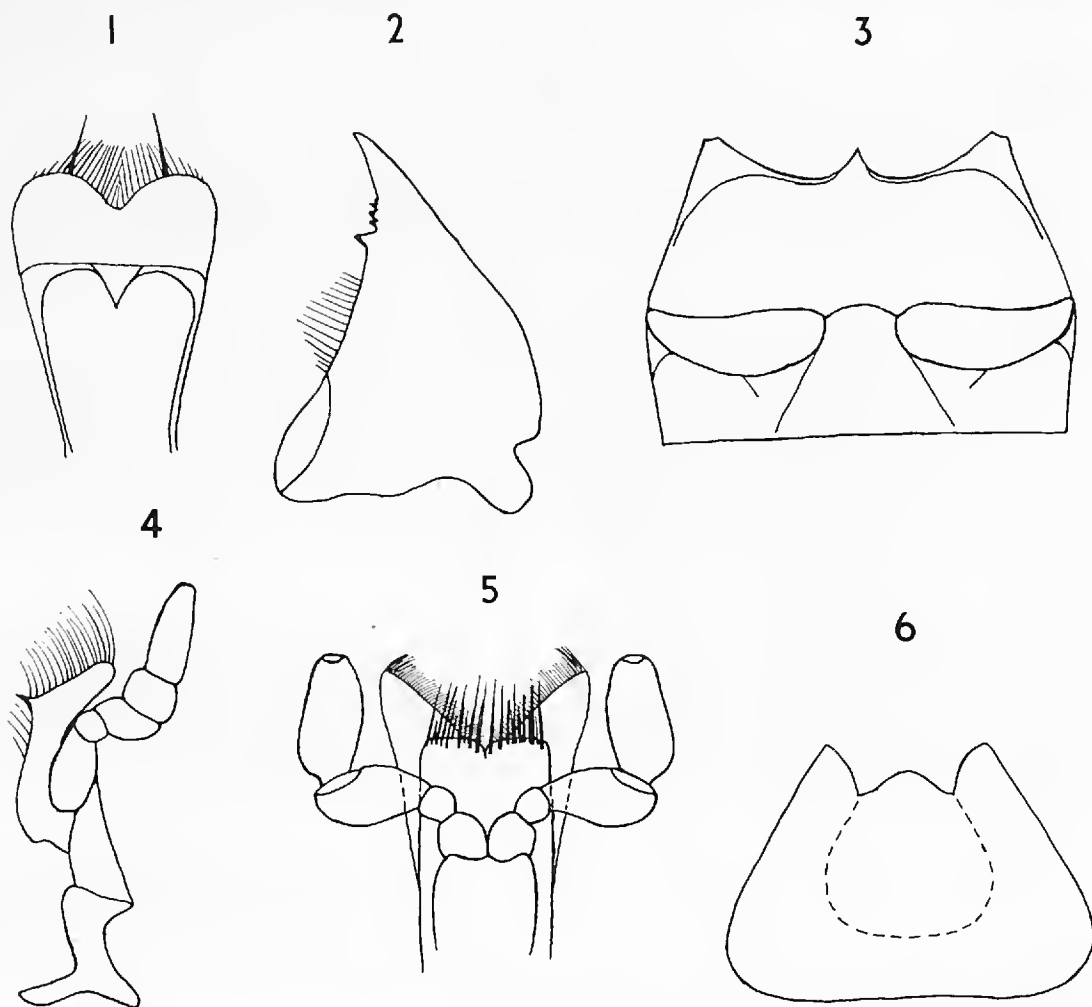
Oval, slightly oblong, convex, shining; clothed with close-lying, silvery-white, rather long pubescence; individuals vary in color from luteus to piceus, light colored specimens have metasternum dark and dark markings on the elytra just behind the middle while the dark specimens have two light longitudinal marks near the suture anterior to the middle. *Head* coarsely punctate. Eyes larger and globular. Antennae, having basal segment little dilated, second less dilated, third slender equal in length to second, 3 to 8 slender and progressively shorter until 8 which is nearly spherical, club 3-segmented, ovate and compact. Antennal grooves convergent, if extended they would meet at a point between anterior coxae. Pronotum with width to length as 1.7 to 1, sides rounded, not narrowing posteriorly, moderately expanded, reflexed, with hind angles bluntly rectangular and projecting back somewhat, hind edge narrowly margined, feebly bisinuate. Elytra entire, conjointly rounded, edges reflexed, not serially punctate. Scutellum triangular, rather small. Pygidium small, completely covered by elytra, closely punctate. None of the other dorsal segments of the abdomen chitinized. Prosternum moderately punctate, process slender and somewhat expanded at tip. Mesosternum short, carinate in middle beneath prosternal process. Mesocoxae close together. Metasternum short, equal in length to first two abdominal segments together, axillary space extending back along episternal suture about three-fourths of distance to hind coxae, median area somewhat depressed. Hind coxae separated by distance equal to width of second abdominal segment, abdominal lobe between coxae nearly truncate, on each side a divergent raised line accentuated by a slight depression along its inner side, the line extends back across entire width of first abdominal segment diverging at about 45 degrees from longitudinal axis. Surface of ventral abdominal segments and metasternum covered with reticulations except for area between divergent lines on first segment which is completely smooth. Mouthparts: Labrum bilobed; mandibles, straight and projecting forward, several small teeth preceding a larger tooth before the tip, grinding surface on inner side of base; maxillae, lacinia broadly truncate, a definite spur on inner edge, tip very densely covered with long setae, palpi first segment small, second short and clavate, third equal to second but more nearly cylindrical, fourth as long as first three together. Labium: Ligula truncate, armed with long stout setae; paraglossae large, transparent, closely fringed with fine setae; palpi with first segment small, second subclavate and swollen, third equal in length to second, cylindrical. Legs short and stout. Tarsi, first three segments broadly dilated and densely pubescent beneath. Claws simple. Length 2.8 to 3.3 mm.

The species was collected by Luis E. Peña while beating native plants in the valley of Las Palmas, COQUIMBO, CHILE, September

30, 1947. *Holotype* and *allotype* are placed in the California Academy of Sciences. *Paratypes*: Sociedad Científica Chilena "Claudio Gay"; U. S. National Museum; American Museum of Natural History; and in the author's collection. The new species differs from the only other member of the genus as shown in the following table:

COMPARATIVE TABLE

	<i>Eumystrops chilensis</i>	<i>Eumystrops centralis</i>
Punctuation:	rather coarse	minute, not dense
Pubescence:	close-lying, silvery-white, conspicuous, as in <i>Epuraea populi</i> Dodge	fine, inconspicuous
Head:	strongly punctate	very feebly punctate
Scutellum:	of moderate size	rather large
Elytra:	entire, conjointly rounded	short and broad, truncate behind
Pygidium:	small, covered by elytra, very closely punctate	very broad, exposed, very obsoletely punctate, almost smooth



Figs. 1-6. *Eumystrops chilensis* n. sp. Fig. 1 labrum, 2. mandible, 3. metasternum and first ventral abdominal segment to show "axillary space" and diverging post coxal lines, 4. maxilla, 5. labium, 6. mentum.

Sharp erected the genus *Eumystrops* in 1898 for a species from Panama and while this species agrees very closely with his definition, he did not figure the mouthparts, so when an undoubted *Eumystrops* sp. becomes available for dissection this new species may be shown to represent a distinct genus. The pronounced spur on the inner edge of the lacinia distinguishes *E. chilensis* from most other Nitidulidae. It is present, however, in two species of *Cillaeus* and the single species *Ithyphenes gnatho* Murray. In many respects the mouthparts are similar to those of *Cyllodes* and *Camptodes*. The post coxal line on the first abdominal segment is a good distinguishing character and is present in varying degrees in several related genera. In *Psilotus* and *Camptodes* it appears as a continuous line enclosing a narrow transverse space behind the coxae. In *Pallodes* the area enclosed reaches nearly half way across the width of the segment with its outer margin strongly sinuate. In *Stelidota* the line encloses a broad triangular space which varies somewhat from species to species but extends about half way across the segment. In *Prometopia* the line extends across about two-thirds of the width of the segment with the outer portion sinuate and the inner portion straight. This post coxal line is broken in *Eumystrops* with the straight inner piece extended nearly across the segment while the other portion of the line is short but easily visible (fig. 3).

BOOK NOTICE

American Social Insects. By Charles D. Michener and Mary H. Michener. D. Van Nostrand Company, Inc., Toronto, N. Y., London, xiv + 267, 109 Plates. 1951. Price \$6.00.

This book on the habits and life histories of the bees, wasps, hornets, ants and termites is a worthy addition to the many books which have been written on this fascinating subject. Its organization, from the first chapter on "What are social insects?" to the last on "Societies of insects and man," has been carefully considered. In addition the last 24 pages are devoted to a short appendix on insect structure and classification, a bibliography, a concise glossary and an index. The text is based on the contributions of both past and present workers as well as on the personal observations and researches of the two authors in the United States, Mexico and Central America. However, the style of writing is largely non-technical and is coupled with a modest use of anthropomorphisms. The 109 full page plates, 30 in color, are in addition to the 267 pages of textual material and represent the efforts of some of the best nature photographers in this country. These illustrations, interleaved with the text, serve both to inform and delight the reader with their artistry.

The Micheners are to be congratulated for a book that contains such a wealth of clearly presented subject matter as to make it a source of enjoyment for naturalists for many years to come.—J. W. MACSWAIN.

NEW AND INTERESTING SPECIES OF DERMESTIDAE
(Coleoptera)

VLADIMIR KALIK

Pardubice, Czechoslovakia

Through the kindness of H. B. Leech and E. C. Van Dyke, I have been able to study some of the Dermestidae from the collection of the California Academy of Sciences, San Francisco. Many interesting species were found, and several of them are treated in the following article.

***Dermestes reductus* Kalik, new species**

Form and color: Oblong, relatively narrow, moderately convex. Prothorax rather flat, broadest in the posterior third, narrowing more to the front, slightly to the base. Elytra as broad as the prothorax, with subparallel sides narrowing gradually in the posterior third. Dorsal surface and under side black. Antennae of 11 segments, reddish brown, with red club. Tarsi brown. *Pubescence:* Upper surface clothed with black and grayish-white hairs. Grayish-white hairs covering almost the whole head, forming several spots on the anterior and posterior margins and one spot on either side of the pronotum; a sparse but long pubescence covers the basal margin and posterior angles of the pronotum; the grayish-white hairs form a broad transverse band on the basal two-fifths of the elytra. This band encloses on each elytron a basal, oval, black spot not reaching either the shoulder or the scutellum; the black hairs form three distinct spots almost in the middle of the band, as in *D. lardarius* Linnaeus. Scutellum with black pubescence. Undersurface covered with predominantly grayish-white hairs; on the legs and ventral segments they are mixed with brown hairs, which predominate especially on the last two to three segments of the abdomen. *Punctuation:* Surface closely punctured, those on the pronotum close together, the distance between them smaller than the diameter of one puncture; elytral punctuation slightly sparser; under side finely and relatively sparsely punctured. *Sexual characters:* The male has a small fovea with a brush of yellow hairs on the median line of each of the 3rd and 4th abdominal sternites. Aedeagus small, curved, widest at the base, narrower at the middle, broadening again towards the tip; parameres approximately as long as the aedeagus, almost of the same width in their whole length, narrowing only at the tip. *Lengths* of four ♂♂ 6.2, 6.5, 6.5 and 6.5 mm. respectively; of four ♀♀ 6.0, 6.2, 6.2, 6.2 mm. *Widths*, 2.2, 2.2, 2.5, 2.3 mm. for the ♂♂; 2.0, 2.2, 2.3, 2.2 for the ♀♀.

Holotype ♂, and *allotype* ♀, from DUPARQUET, QUEBEC, CANADA, 27. V. 1940 and 26. IX. 1934, G. Stace Smith, collector; in the California Academy of Sciences. *Paratypes:* a pair from the type locality, 11, XI. 1934, under bark *Populus*, in Kalik collection; ♂, ♀ from Canada, in coll. Museum Prague; ♂, ♀, from Canada, in Kalik collection.

Comparative notes: Lepešme (1950:65) described *Dermestes*

lardarius, ab. *reductus* as follows: "Je donne le nom de *reductus* à des exemplaires de petite taille (moins de 6 mm.) à pubescence claire des élytres particulièrement blanche; je n'ai observé cette forme que d'Amérique du Nord." Notwithstanding the brief statements of the description I believe that my specimens are identical with the type which the author obtained from Mr. J. Mitchel and returned to him. At present the type is not accessible to me, and I therefore cannot fully confirm my opinion, but in any case I consider the specimens described by me as of specific status for the following reasons:

(a) According to G. Stace Smith and H. B. Leech, who have both collected living specimens, *D. reductus* is a species of wooded areas, away from human habitations. Of the Quebec examples, one was found on fresh lumber, one under the bark of *Abies* sp., and two under the bark of *Populus* sp. Typical *D. reductus* has also been collected in British Columbia at Creston, 18. X. 1931 (G. Stace Smith), Salmon Arm (under the bark of an old Douglas fir log—H.B.L.), and Vernon (Ralph Hopping). *D. lardarius* is a species predominantly bound to food and material worked by man.

(b) The range in size of the eight type specimens of *D. reductus*, as mentioned in the description, is 6 to 6.5 mm. In most examples of *D. lardarius* the size is 7 to 8.5 mm. The relation of the numbers of specimens of different sizes among the 89 *D. lardarius* at present at my disposal from different localities, is given in the graph (fig. 3). It is evident that a size of less than 7 mm. is quite exceptional and extreme (apparently starvation forms). In three specimens from North America the length is 8.0, 8.5, and 9.0 respectively.

(c) The whole beetle is black, even the elytra under the transverse band of gray hairs, whereas in *D. lardarius* this area is red to brown. The dark spot at the base of each elytron is not divided into two smaller spots by gray hairs, as it is in *D. lardarius*.

(d) The sides of the elytra are relatively more parallel, the lateral margins of the prothorax less raised, the body flatter, than in *D. lardarius*.

(e) The posterior margins of the abdominal segments are interruptedly gray and brown pubescent; in *D. lardarius* the whole segments are unicolored gray, brown or black.

(f) In *D. reductus* the aedeagus narrows in the middle (fig. 1), whereas in *D. lardarius* it is of almost equal width for its whole

length (fig. 2). I have not yet had a sufficient number of males of the the new species, and so have only been able to compare the shape of the aedeagus in two specimens. Thus it will be necessary to convince ourselves of the constancy of this feature by examining a greater number of males.



Fig. 1. Aedeagus of *Dermestes reductus* Kalik, new species. Fig. 2. Aedeagus of *Dermestes lardarius* Linnaeus.

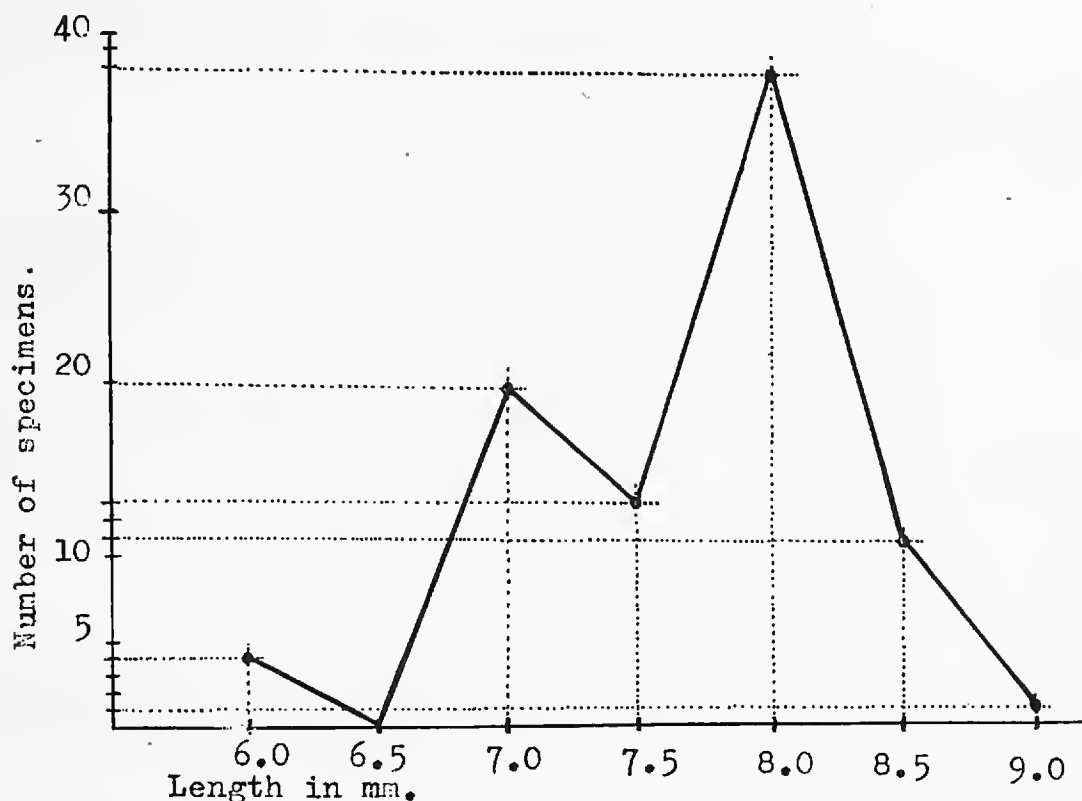


Fig. 3. Graph showing relation between sizes of specimens and number of specimens of *Dermestes lardarius* Linnaeus.

Dermestes leechi Kalik, new species

Form and color: Oblong, moderately convex, brownish-black. Eyes fairly large. Pronotum broadest in posterior third, strongly narrowing towards the anterior end, of semicircular shape in dorsal view, moderately narrowed basally, anterior angles invisible from above, posterior angles rounded. Scutellum cordate. Elytra subcylindrical, with sub-parallel sides which narrow only in the posterior quarter. Antennae of 11 segments, reddish-brown, club 3-segmented, inserted almost in the middle of the funicle; 8th segment short, transverse.

Punctuation: Above rather coarsely punctured, punctures on disk of pronotum separated by approximately their own diameters. Abdomen more finely but fairly closely punctured. *Pubescence:* Upper surface covered uniformly

but not too densely with a short grayish-yellow pubescence, that of under surface similar but much denser. *Sexual characters*: Third and 4th abdominal segments of male each with one circular fovea with a brush of hairs. Aedeagus very short, slightly curved, of almost the same width throughout. Parameres about a fourth longer than the aedeagus, of equal width throughout, narrowing only at the apices which are bordered with yellow hairs. *Length* of ♂ and ♀: 7.5 to 8.0 mm.; width 2.2 to 2.5 mm.

Holotype ♂, and allotype ♀, from BHADRAVATI, TANJORE DISTRICT, southern INDIA, in collection of Museum Prague. *Paratypes*, all topotypical; ♂, 2 ♀ ♀, in collection of Museum Prague; 1 ♀ in the California Academy of Sciences, San Francisco; 2 ♂ ♂, 1 ♀ in Kalik collection.

Comparative notes: This species resembles by the uniformity of its pubescence *D. peruvianus* Castelnau and *D. nidum* Arrow. It is distinguished from the former mainly by the fact that it is smaller, that the male has a fovea on both the 4th and 5th abdominal sternites, that the pronotum is more convex, its anterior angles not flat and not visible from above. It is distinguished from *nidum* by the elytra being without trace of striae, by its smaller size, and by its more convex pronotum. I am pleased to name this species in honor of Mr. Hugh B. Leech of the California Academy of Sciences, San Francisco.

DERMESTES UNICOLOR Lpesme

In the material from the California Academy of Sciences I found six specimens of *Dermestes* from San Roque, Baja California, 2.8. 1922, which I regarded originally as a variety of *D. carnivorus* F. It is, however, possible that these specimens represent Lpesme's species *D. unicolor*, whose type in the Museum in Paris I had no opportunity to examine. Lpesme's description (1950:57) runs as follows:

"*D. unicolor* n. sp. Long.: 7-8 mm.—Très voisin du précédent [*carnivorus* F.], plus convexe. Brun noir, uniformément couvert à la face dorsale d'une pubescence blonde peu épaisse régulièrement couchée en arrière, aussi bien sur le pronotum que sur les élytres. Face sternale garnie de pubescence blanche, exception faite seulement d'une tache triangulaire à l'angle antéro-latéral des cinq sternites abdominaux apparents. Dispersion géographique.—Antilles (Muséum de Paris)."

The specimens, of which two are now in my collection, very much resemble *D. carnivorus*. Some have quite black elytra, others are slightly brown on the shoulders; the whole surface is uniformly grayish yellow pubescent, only the sides of the pronotum having

white hairs directed from the side inwards. This white pubescence of the sides of the pronotum does not, however, stand out strikingly from the general, light pubescence of the surface. The underside of the body has the pubescence as in *D. carnivorus*. The aedeagus of the male is very similar to that of *D. carnivorus*, which has perhaps a slightly narrower tip. According to my examples I believe that they represented a form of *D. carnivorus*. Only after a comparison with Lepesme's type I shall be able to confirm my opinion that the cited examples are actually identical with *D. unicolor*. To be sure that this species is only a form of *D. carnivorus*, I am in need of more material for comparison. Until that time I shall take Lepesme's identification as for that of an independent species.

DERMESTES SOBRINUS Leconte

I have in my collection one female specimen of *Dermestes* from Cuba, which I regard as belonging to this species according to Reitter's remarks in 1879 (p. 28) "Diese Art ist dem *carnivorus* sehr nahe verwandt und ist an den ganz dunklen Seitenstücken der Hinterbrust leicht zu erkennen." This character is not mentioned at all in the original description by Leconte (1854: 108). Though the underside of my specimen is in part worn, I ascertained at the posterior margin of the sternites of the abdomen brown spots, which might correspond to the feature in the original description: "abdomine maculis nigris quadruplici serie ornato." The femora have small spots with white hairs. On the whole this species is very similar to *D. carnivorus* or *unicolor* Lepesme, uniformly grayish yellow pubescent on the upper surface, only the epipleurae and sides of the prothorax narrowly grayish white, on the shoulder a small spot of yellow hairs. The whole metasterna densely covered with brown pubescence.

THAUMAGLOSSA RUFOMACULATA Pic

I found five specimens of this beautiful and characteristically colored beetle in the material of the California Academy of Sciences: 1 female from Nanking, China, V. 3. 1923, and 4 ♀ ♀ from Alabang, Philippine Islands, Luzon Isl., XI. 9. 30, collection of E. C. Van Dyke. The British Museum has the type of *T. rufomaculata* Pic (described as an *Aethriostoma* in 1938: 12 from Kuala Lumpur) marked as conspecific with *T. laeta* Arrow, 1915: 435, whose type is also in the British Museum. I sent one of my specimens for comparison to London. Mrs. H. Cook kindly informed me

that all three specimens, both types and the example I had sent, seem to be completely identical except for the shape of the red spot on the discus of each elytron. According to Mrs. Cook's drawings the spot is round in *Thaumaglossa (Aethriostoma) rufomaculata* Pic, of irregular shape and probably on the anterior side with worn hairs as shown in the figure in *T. laeta* Arrow. In one of my specimens the spot is completely round, in the others partly irregular. This irregularity is due to the fact that the red pubescence covering the red spot on each elytron is worn in some specimens, and thus the light coloring of this spot is not clear at the margin and partly fuses with the dark neighborhood. Until I am able to re-examine the conspecificity of the two species with conclusive validity I retain for my specimens the designation *T. rufomaculata*, as according to the shape of the spot they are closer to this type. If the two species should prove conspecific. Arrow's name will be valid.

Matsumura & Yokoyama described (1928: 53-4) from Formosa *Orphilus bimaculatus*. As in the description they speak distinctly of the surface as being covered by pubescence, their species cannot be a representative of the genus *Orphilus* whose species are bare; according to the diagnosis: "Elytra with a large reddish circular spot on its back, closely punctured and furnished with black (in general part) and reddish hairs (on the spot)," it is most probably again *T. rufomaculata (laeta?)*. If the two suppositions on the conspecificity of the species mentioned should be confirmed, the synonymy would be as follows: 1915, *Thaumaglossa laeta* Arrow. 1928. *Orphilus bimaculatus* Matsumura & Yokoyama. 1938. *Aethriostoma rufomaculata* Pic.

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A NEW SPECIES OF *LORDOTUS* FROM SOUTHERN CALIFORNIA

(Bombyliidae: Diptera)

J. C. HALL

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During a five-week period of collecting in the San Gabriel Mountains of the Angeles National Forest, Los Angeles County, California, two species of the genus *Lordotus* Loew were collected. One of these was identified from the key to *Lordotus* by Painter¹ (1939) as *L. planus* O.S. The other appeared to be a new species, which ran to couplet three in Painter's key, and this assumption was verified by R. H. Painter, who kindly examined the specimens and compared them with the determined species of *Lordotus* in his collection.

The species was found in great abundance during the months of June and July. It frequented open areas, usually fire breaks, on the brush-covered ridges at elevations of 2,500 to 6,000 feet. The flies were caught resting on the ground and none were observed visiting the many species of flowering plants that were in abundance at that time.

Lordotus ermae Hall, new species²

Female—Integument black; wings hyaline, veins on basal one-fourth pale, apical three-fourths dark; costal cell and subcostal cell yellowish; first basal cell infuscated in some lights; haltere stalk yellow, knob white. Antenna with dark buff pile above, longer, paler below; face densely buff pilose, tomentum wanting; palpi with long yellow and short black pile intermixed; occiput pale buff pilose, thick white tomentose; thoracic dorsum with pale buff pile intermixed with white pile anteriorly, becoming shorter and scattered posteriorly, becoming long and thick towards base of scutellum, thick white tomentum overall, a patch of white pile above wing bases; dense white tomentum extends from wing base to humeral cross-vein; thoracic pleural area buff pilose; tomentum wanting, pteropleuron bare; coxae with long buff pile; femur dark yellow pilose and tomentose; squama buff pilose; abdominal

¹Painter, R.H., 1939. Notes on type specimens and descriptions of new North American Bombyliidae. Trans. Kansas Acad. Sci. 42:267-301.

²A modern patronymic dedicated to my wife.

dorsum buff pilose; basal one-half of pile yellowish, apical one-half white giving a buff color to pile, a stripe of white tomentum extends from segment II to segment IV on a median dorsal line; pygidium with short yellow pile, scattered white tomentum; abdominal venter darker buff pilose, tomentum wanting. Length of first antennal segment 0.45 mm.; second 0.20 mm.; third 1.0 mm.; face slightly protruding below and above oral opening; proboscis nearly twice as long as anterior tibia; middle tibia with a strong apical spur; costa not denticulate. Length of body 10-12 mm.

Male—Similar to female but differing in the following: Pleural area ground color lighter. Antennal pile partly black towards apices of segments I and II; femora without dense tomentum; abdominal pile white, tomentum wanting; body pile in general lighter. Genitalia apparently identical to those of congeners; length of body 10-13 mm.

Holotype, female and allotype male (Cal. Acad. Sci.), TANBARK FLAT, LOS ANGELES COUNTY, CALIFORNIA, June 20, 1950 (J. C. Hall). *Paratypes*—(all from Los Angeles County, California), 35 males, 25 females, Tanbark Flat, June 19-July 4, 1950 (J. C. Hall, R. Schuster, D. C. Blodget, C. J. Weinmann, A. T. McClay, W. O. Marshall, H. F. Robinson, W. A. McDonald, P. D. Hurd, J. W. MacSwain, T. R. Haig, F. X. Williams, individual collectors of specimens). 1 male, Camp Baldy, June 26, 1950 (K. G. Whitesell). 1 female, Johnstone Point, July 14, 1950 (R. Schuster). 1 female, Crystal Lake, June 29, 1950 (H. F. Robinson). 1 male, Big Dalton Dam, June, 1950 (F. X. Williams).

Paratypes are in the collections of the following: California Academy of Sciences, California Insect Survey, University of California at Berkeley, University of California at Davis, U. S. National Museum, R. H. Painter (Kansas State College), F. R. Cole, and the writer.

Variations—Male and female—pleural area ground color black to gray. Antennal pile yellow to black above, yellow to dirty white below; abdominal pile buff to pale yellow to dirty white to brown depending upon the light used; stripe of white tomentum sometimes scattered but always present in the female, wanting in the male.

L. ermae appears to be more closely related to *planus* Coquillett, *miscellus* Coquillett, and *junceus* Coquillett than to *gibbus gibbus* Loew. It differs from *planus* in the absence of infuscations on the wings, and the black legs; from *miscellus* in the absence of denticulations of the wings, and the broad dark pilose dorsal band on the abdomen; and from *junceus* in the absence of black or brown pile on the abdomen, and minute black points on the front. It is also several times larger than any of the above three. The male genitalia are similar in all of the above.

THE GENUS EURYSA IN AMERICA NORTH OF MEXICO

(Homoptera: Fulgoridae, Delphacinae)

R. H. BEAMER*

University of Kansas, Lawrence

I am following Muir and Giffard in the placing of these species in *Eurysa*. They could possibly belong to the European genus *Eurybregma* but at the present time it seems best to consider them in *Eurysa*.

EURYSA Fieber

EURYSA Fieber, Verb. Zool. Bot. Ges. Wien, XVI (1866), p. 520, genotype *lineata* (Perr.).

This genus is characterized by the wider than long crown almost devoid of carinae and the front widest at base without carinae on basal third.

KEY TO SPECIES

1. Male styles with finger-like projection on inner apical margin.....*kormusi* (Crawf.)
Male style without such a projection.....2
2. Pygofer in lateral view with angular foot-like process on ventro-caudal margin.....*magnifrons* (Crawf.)
Pygofer without such a process.....3
3. Anal segment with processes extending straight out from segment.....*obesa* Beamer
Anal segment with processes curved.....*montana* Beamer

EURYSA KORMUSI (Crawford)

MEGAMELUS KORMUSI Crawford, C. L., A Contribution Toward a Monograph of the Homopterous Insects of the Family Delphacidae of North and South America, 1914, p. 614.

Brachypterous form: Easily separated from the other species of this genus by the finger-like process on the inner margins of the apices of the styles. Length ♂ 3.0 mm., ♀ 3.75 mm.

Structure: Front not quite twice as long as wide, widest on basal third, very slightly narrowed toward base, more so toward apex, definitely tricarinate on apical two-thirds; crown as wide as median length, apex rounded without carinae, carinae more or less visible on base; elytra longer than wide, hyaline, veins raised, apices truncate with rounded corners.

Color: General color stramineous more or less suffused with fuscous; dorsum of abdomen with darker stripe on lateral margins.

Genitalia: Pygofer in lateral view more or less rectangular with posterior margin extended posteriorly over about one-third distance in large triangle; anal segment with a pair of very broad ventrally curving processes; aedeagus wide at base, narrowed to long parallel-sided shaft, slightly bent dorsally, apex surrounded by about eight sharp teeth, three additional teeth just

*Contribution from the Department of Entomology, University of Kansas.

beyond middle of ventral margin; styles not visible in this view. In caudal view styles widest on basal half, diverging, inner margin narrowing to about half median width on outer fifth, a finger-like projection on inner margin of apices.

Described originally from a brachypterous pair from Ormsby County, Nevada (Baker).

Types deposited by Crawford in the collection of Pomona College, Pomona, California.

Redescribed from ♂ and 4♀♀, Sears Point, Marin County, California, May 18, 1931, E. P. Van Duzee.

EURYSA MAGNIFRONS (Crawford)

MEGAMELUS MAGNIFRONS Crawford, C. L., A Contribution Toward a Monograph of the Homopterous Insects of the Family Delphacidae of North and South America, 1914, p. 614.

Brachypterous form. Structure: Front not quite twice as long as basal width, widest just basad of middle, slightly narrowed toward base, more so toward apex, definitely tricarinate except at base crown distinctly wider than long, carinae indefinite on apex, more distinct basally; elytra longer than wide, veins raised, apices rounded.

Color: General color stramineous to almost brown, carinae of pronotum, scutellum and abdomen and pustules of abdomen light.

Genitalia: In lateral view pygofer of male much wider on ventral margin with an angular foot-like projection at ventral caudal corner; anal segment with caudal side extended into a pair of broad, very long curving processes; aedeagus long, slightly curved ventrally, with apex enlarged to twice diameter of shaft with one recurved, short hook on dorsal margin and ventral margin from apex to more than middle of shaft with about 15 retrorse teeth; styles not visible in this view. In caudal view, styles widest at base, diverging, outer margins sinuate and narrowing to avicephaliform apices; aedeagal brace wide, very slightly produced.

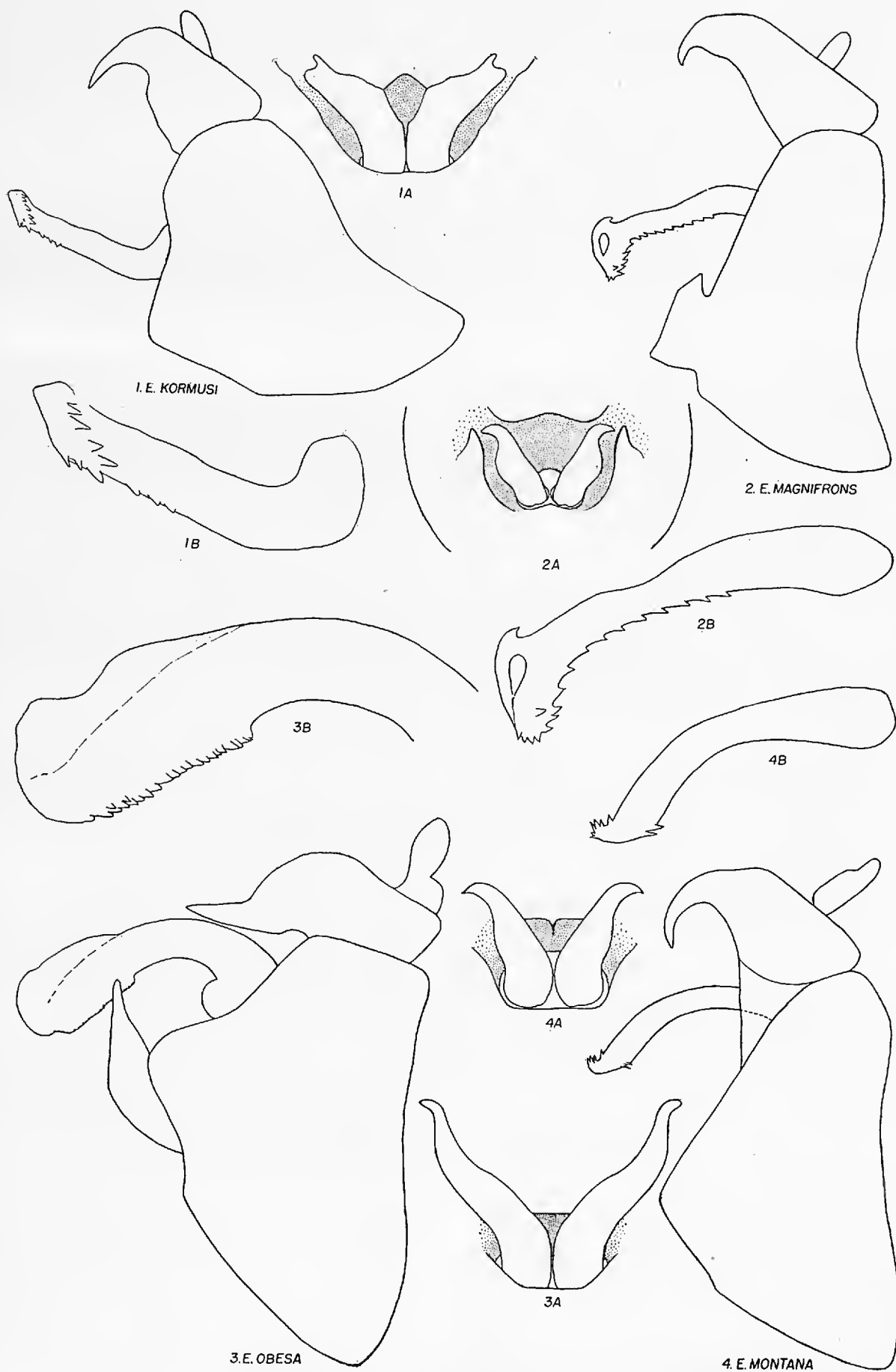
Redescribed from 3 ♂ ♂ and 4 ♀ ♀, Florissant, Colorado, July 6, 1949, R. H. Beamer; ♂ ♀, Garrison, Montana, July 10, 1933; ♂, Merritt, British Columbia, Canada, August 3, 1931; 3 ♂ ♂ and 3 ♀ ♀, Yellowstone National Park, July 12, 1939, D. J. and J. N. Knull. Crawford's male holotype is Cat. No. 15986, U. S. National Museum.

Macropterous form: Like the brachypterous form except with long flight wings and generally darker in color. Elytra fumous throughout and darker still from cross-veins to apices.

Holomorphotype ♀, Florissant, Colorado, July 6, 1949, R. H. Beamer! in Snow Entomological Collections, University of Kansas.

Eurysa obesa Beamer, new species

Brachypterous form: Resembling *Eurysa kormusi* but elytra



Figs. 1-4. Genitalia of some species of *Eurysa*. Figs. 1, 1A, 1B, *E. kormusi*. Figs. 2, 2A, 2B, *E. magnifrons*. Figs. 3, 3A, 3B, *E. obesa*. Figs. 4, 4A, 4B, *E. montana*.

about as wide as long instead of longer than wide, and male styles in caudal view widest at base and narrowed to apices. Length ♂ 3.5 mm., ♀ 4 mm.

Structure: First segment of antennae longer than wide; front slightly longer than broad, widest at base, definitely tricarinate on apical two-thirds; head wider than thorax; crown wider than long, apex rounded, carinae indistinct; elytra about as wide as long, semihyaline, apices almost truncate, veins raised, abdomen often with raised median longitudinal ridge and rows of pustules along sides.

Color: General color stramineous, body often more or less mottled with brown, some specimens with broad fumose line either side of middle of dorsum.

Genitalia: In lateral view, pygofer almost triangular, narrowest at ventral corner; anal segment with pair of heavy processes extending away from segment at caudo-ventral corner; aedeagus heavy, curved ventrally in almost half circle, widened on outer third, ventral margin more or less serrate in this region; styles widest at base, gradually narrowed to sharp apices. In caudal view, aedeagal brace broad and even, not raised or excavated; styles widest at base, sinuate, gradually narrowed to diverging apices.

Holotype ♂, *allotype* ♀ and 2 ♂ *paratypes*, LARAMIE, WYOMING, 40 miles N.E., July 13, 1937, R. H. Beamer; other *paratypes*: 2 ♂ ♂ and ♀ North Powder, Oregon, July 13, 1931, R. H. Beamer; 11 ♂ ♂ and 13 ♀ ♀, Yellowstone National Park, Wyoming, July 12, 1939, D. J. and J. N. Knull.

Macropterous form: Like the brachypterous form except slightly darker and with flight wings extended much beyond the body.

Holomorphotype ♂, Barclay, Utah, July 2, 1931, R. H. Beamer; ♂ *paramorphotype*, Deeth, Nevada, July 21, 1945, R. H. Beamer; *allmorphotype* ♀; 2 ♂ ♂ and 6 ♀ ♀ *paramorphotypes*, Yellowstone National Park, Wyoming, July 12, 1939, D. J. and J. N. Knull. Types in Snow Entomological Collections and collections of Ohio State University.

Eurysa montana Beamer, new species

Brachypterous form: Resembling *Eurysa obesa* but sides of dorsum of abdomen with a more definite black longitudinal vittae, aedeagus of male not swollen on outer third and anal processes curved ventrally. Length ♂ 3 mm., ♀ 3.5 mm.

Structure: First segment of antennae slightly longer than width; front widest at base, length to width is as 5 3/4 is to 3 1/2, strongly tricarinate on apical two-thirds; crown broad, much wider than median length, carinae absent except basally in some specimens; elytra definitely longer than wide, veins raised, apices broadly rounded; dorsum of abdomen with segments keeled on median line and with pustules on lateral margins.

Color: General color stramineous, sometimes fumous; dorsum of abdomen usually with a more or less definite fumous longitudinal strip on side of middle.

Genitalia: In lateral view, pygofer almost triangular with dorsal margin narrowest; anal segment with a pair of ventrally curved processes arising on ventro-caudal margin; aedeagus long with sides almost parallel, gently curved ventrally with apex slightly recurved and with several short sharp teeth on both margins; styles not visible from this view. In caudal view styles widest at base, diverging, narrowed evenly from bases to out-curving apices, outer margin sinuate; aedeagal brace with slight excavation and caudally projecting trough.

Holotype ♂, *allotype* ♀, 6 ♂ and 4 ♀ *paratypes*, LARAMIE, WYOMING, August 5, 1949, R. H. Beamer; other *paratypes*, 14 ♂ ♂ and 5 ♀ ♀, same place and date, J. R. White.

Macropterous form: Like the brachypterous form except with flight wings. *Holomorphotype* ♂, Laramie, Wyo., August 8, 1949, J. R. White; *allomorphotype* ♀, same place and date, R. H. Beamer. Types in the Snow Entomological Collections.

A NEW GENUS OF CHRYXINAE FROM BRAZIL AND ARGENTINA

(Hemiptera: Reduviidae)

ROBERT L. USINGER

University of California, Berkeley

The subfamily Chryxinae was proposed by Champion (1898) for *Chryxus tomentosus*, a new genus and species described by him from two specimens collected in Panama. A third specimen has since been collected in British Guiana (British Museum).

A second species, *Chryxus travassosi* Lent and Wygodzinsky (1944) was described from Brazil. Then, in 1946, a new genus and species, *Lentia corcovadensis* Wygodzinsky, was described from Brazil and the position of the subfamily was reviewed. This completes the published history of this small but interesting group.

The present note is prompted by the discovery in the Paris Museum of a second female specimen of *Chryxus travassosi* Lent and Wygodzinsky*. This specimen is from Misiones, Argentina, Env. de San Ignacio, Villa Lutecia, E. R. Wagner, 1910. It agrees perfectly with the description and figures given by Lent and Wygodzinsky except that the fourth antennal segment is longer than

*Dr. Wygodzinsky writes (March 26, 1951) that a male specimen was collected by O. Schubart on May 19, 1950, Estacao Experimental, Pirassununga, Sao Paulo, Brazil, in house (Wygodzinsky Collection).

the third, the ratio of the two segments being 25:21. Since all other characters are identical it is suggested that perhaps the apex of the fourth antennal segment was broken off in the type.

Although *Chryxus tomentosus* and *travassosi* are obviously related, a comparison of the two (British Museum, 1948) revealed certain striking differences which would warrant generic separation elsewhere in the Reduviidae. Accordingly, *Chryxus travassosi* Lent and Wygodzinsky (1944) is here designated as the type species of the new genus *Wygodzinskyella*. The characters of the type are given in great detail by Lent and Wygodzinsky (1944). *Chryxus* Champion differs in that the scutellar spine is thickened apically (flattened in *Wygodzinskyella*), the corial veins are distinct on the basal half of the transparent corium (practically indistinguishable on the opaque corium in *Wygodzinskyella*), the connexivum is alternated and the legs entirely pale (connexium uniformly pale, femora broadly black at middle, tibiae black except at basal fourth and tarsi black in *Wygodzinskyella*), and the size smaller (about half as long as *Wygodzinskyella*).

It is a pleasure to dedicate this distinctive genus to Dr. Peter Wygodzinsky, whose outstanding work has contributed so much to our knowledge of the Hemiptera of the Neotropical Region.

CHAMPION, G. C.

REFERENCES CITED

1898. *Biologia Centrali-Americana*, Insecta, Rhyn., Hem-Heter., 2:180.
181, Tab XI, fig. 9.

LENT, H., and P. WYGODZINSKY

1944. Sobre uma nova espécie do gênero "Chryxus" Champion, 1898.
Rev. Brasil. Biol. 4:167-171, 19 figs.

WYGODZINSKY, P.

1946. Sobre um novo gênero e uma nova espécie de Chryxinae e considerações sobre a subfamília. *Rev. Brasil. Biol.* 6:173-180, 12 figs.

ANOTHER AMERICAN FLY ATTRACTED TO SMOKE

(Diptera: Empididae)

EDWARD L. KESSEL

University of San Francisco

In a paper published a few years ago (Wasmann Collector, 7:23-30. 1947), the writer reported his observations on the American smoke flies belonging to the genus *Microsania* of the family Clythiidae. On August 20, 1946, hundreds of these small dipterans were attracted to the smoke of an outdoor fireplace at the owner's home in Mill Valley, Marin County, California. On that same

occasion numerous individuals of a fly species whose members are about twice the size of the *microsanias* were seen flitting about on the leaves of a California laurel bush which was in the direct path of the smoke. They mingled with the *microsanias* and were the only other insects which seemed to be attracted by the smoke. A specimen of this second species, which proved to be an empidid, was sent to A. L. Melander, who kindly identified it as *Hormopeza brevicornis* Loew. In his letter Dr. Melander says, "I have taken specimens of *Hormopeza* in the house where they gather on the window panes when they attempt to leave. I have also taken them on the walls of my tent when camping. *Microsania* gathers on the tent fabric also. Maybe these insects were attracted in the first place by smoke."

Inasmuch as empidids are notorious as predators on other insects, particularly flies, it was supposed that the *hormopezas* were present to prey on the *microsanias*. However, none was seen to attack any member of the smaller species. Because the writer's interest on that occasion was concerned primarily with *Microsania*, no mention was made of *Hormopeza* in the report. It was hoped that subsequent observations would be made with emphasis on *H. brevicornis*, but a change of residence on the part of the writer has interfered with this plan. Therefore these notes are published without further delay.

This seems to be the first American species of *Hormopeza* which has been observed to possess a positive tropism toward smoke. Nevertheless, Sharp (Ent. Monthly Mag., 54: 244. 1918) has reported a small dipteran sharing the hot and smoke-permeated atmosphere of a forest-fire area in England with the buprestid beetle, *Melanophila acuminata* De G. This fly was identified later by Mr. J. E. Collin as *Hormopeza obliterated* Zett. It seems probable, therefore, that the species of *Hormopeza*, like those of the genus *Microsania*, are irresistably attracted to smoke. What benefit, if any, they receive from this response remains to be demonstrated. Likewise the particular attractant in the smoke remains to be identified. Several writers, including Champion (Ent. Monthly Mag., 54: 199-200, 1918), Van Dyke (Pan-Pac. Ent., 3: 41. 1926), and Linsley (Jour. Econ. Ent., 36: 341. 1943) have added to the observations on species of *Melanophila* being attracted to smoke. Brues (Psyche, 57: 114-115. 1951) has reported that the vespid, *Eumenes curvata* Sauss., is also attracted to smoke. It would be

interesting to know if the positive fumotropic responses of the flies, beetles, and wasps mentioned above are initiated by the same constituent of the smoke.

TRIATOMA PROTRACTA INFECTED WITH
TRYPANOSOMA CRUZI AT RIVERSIDE, CALIFORNIA
(Hemiptera: Reduviidae)

On November 27, 1950, *Triatoma protracta* (Uhler) was collected between Arlington and Lake Mathews in a canyon 3 miles south of Arlington and 5 miles south of Riverside, California.

This is the first record of *Triatoma protracta* from this locality and moreover, infected *Triatoma* have not been reported previously from the vicinity of Riverside, California. A total of fifteen nymphs and three adults were taken from three nests of wood rats, *Neotoma fuscipes macrotis* Thomas. On examination of feces and gut contents two fifth instar and two fourth instar nymphs were found to be infected with flagellates. Stained slides of this material showed organisms morphologically identical with *Trypanosoma cruzi* Chagas.

A survey is being conducted to determine the incidence of infection in the vertebrate and invertebrate hosts of *T. cruzi* in the canyon mentioned above. Infected *Triatoma* have been previously reported from San Diego Co. by Kofoid and Donat, 1933¹; Fallbrook, San Diego Co. by Wood, 1944²; and Eaton Canyon, Pasadena, Calif., by Wood 1938³—RAYMOND E. RYCKMAN

REINHARDIANA NEW NAME FOR HYPENOMYIA
TOWNSEND (DIPTERA: TACHINIDAE OR
LARVAEVORIDAE)

A genus *Hypenomyia* (type *petiolata* Townsend) was proposed by C. H. T. Townsend in 1919 in *Proceedings of the United States National Museum*, Volume 56, page 545; it is considered a valid genus. However, P. H. Grimshaw proposed the same name in 1901 in *Fauna Hawaiiensis: Diptera*, Volume III, Part 1, page 53.

The new name **Reinhardiana** is here proposed for *Hypenomyia* Townsend, 1919, *nec Hypenomyia* Grimshaw, 1901, in recognition of Professor H. J. Reinhard's many contributions on the American Muscoidea.—PAUL H. ARNAUD.

¹Calif. West. Med. 38:245-249.

²Jour. Parasitology, 30(3):199.

³Science, 87 (2260):366-367.

BOOK NOTICE

The Sucking Lice, by G. F. Ferris, with collaboration of Chester J. Stojanovich. Volume I of the Memoirs of the Pacific Coast Entomological Society, California Academy of Sciences, San Francisco, ix + 320 pages (Photo offset). 1951. \$6.00.

The importance of the sucking lice as ectoparasites of mammals and as vectors of agents of disease is well recognized but it has remained for Dr. Ferris to present in a practical, readily usable form the pertinent information on the systematics of the group.

The 124 excellent figures do much to clarify the text, not only serving as aids in identification of sucking lice but also in understanding the morphology of lice, particularly of the mouthparts.

A short section is devoted to a consideration of the ectoparasites of birds and mammals, followed by a detailed chapter on the morphology and anatomy of the Anoplura. The structure of the head and mouthparts is given special attention. There is a short chapter on growth and development including descriptions with figures of eggs and other immature stages of Anoplura. A historical review of the taxonomic status of the sucking lice is given with the characteristics of the order described. Ordinal separation of sucking lice from biting lice is argued primarily on the basis of profound differences in morphology of the mouthparts, minimizing claims for relationship made on the basis of similarities in the tracheal system of the two groups, or on similarities of habit.

The classification within the order is outlined in a short section giving the author's reasons for adapting the system employed. Here again Ferris has emphasized the morphological basis for establishment of family and subfamily boundaries. He recognizes that his opinions will find criticism, as for example in allying the genus *Pedicinus* with the group established as the family Hoplopleuridae rather than in the family Pediculidae as is the usual practice. The most extensive chapter of the book is a review of the families, subfamilies, genera and species of the Anoplura. This is replete with keys down to the species level. Commonly encountered or otherwise important species are well illustrated. A mammalian host list adds to the usefulness of the text. The final chapter deals with the distribution of the Anoplura, delving into hypotheses and speculations on the probable phylogeny of various groups of sucking lice in relation to host phylogeny. The book is a "must" to all who are interested in ectoparasites of mammals.—DEANE P. FURMAN.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

E. O. ESSIG
Vice-President

R. L. USINGER
President

D. D. JENSEN
Secretary

PROCEEDINGS

Two Hundred and Fifteenth Meeting

The two hundred and fifteenth meeting of the Pacific Coast Entomological Society was held at 7:30 p.m. on February 16, 1951, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Usinger conducted the meeting. The following members were present: W. C. Day, E. O. Essig, E. C. Van Dyke, R. F. Smith, O. E. Bryan, Otto W. Graf, S. G. Watkins, P. H. Arnaud, J. Figg-Hoblyn, Lynne Scott, Laura M. Henry, G. F. Ferris, J. Gordon Edwards, William Hazeltine, D. P. Furman, W. W. Middlekauff, R. L. Douth, J. E. Gillasp, E. A. Smith, Theodore Aarons, W. C. Bentinck, C. A. Downing, P. A. Adams, C. Don MacNeill, T. F. Leigh, F. X. Williams, W. W. Sampson, J. N. Simons, W. H. Wade, E. R. Kessel, Berta B. Kessel, L. R. Gillogly, H. B. Leech, G. A. Marsh, J. W. Green, V. M. Stern, K. F. Innes, Jr., R. W. L. Potts, G. F. Carter, J. W. MacSwain, Norman Lewis, R. L. Usinger and E. G. Linsley. The following visitors attended: Helen L. Day, W. W. Allen, Mrs. W. W. Allen, Mrs. D. E. Bryan, Anne Minaker, Kenneth Beck, C. E. Bodwell, Mrs. R. L. Douth, Mrs. J. E. Gillasp, Heidi Aarons, Janice Downing, Allan D. Telford, H. R. MacCarty, Tom Lauret, Elsie Sampson, Barbara Stern, Mrs. Lorin Gillogly, Peter D. Ashlock, and Robert G. Krueger.

The minutes of the meeting held December 9, 1950, were read and approved.

The following were elected to membership in the Society: John Figg-Hoblyn, Benjamin Keh, Thomas H. Lauret, Norman A. Lewis, Edythe B. Braff, and William E. McMillan.

The proposed amendments to the By-Laws of the Society, which were mimeographed and circulated at an earlier meeting, were placed into effect by a unanimous vote of the membership present. The previous wording and the amended wording are given below:

AMENDMENTS TO THE BY-LAWS OF THE
PACIFIC COAST ENTOMOLOGICAL SOCIETY

Previous wording

Article II, Section 3: The members of the Executive Board shall consist of the chairman of standing committees, the officers of the Society, and the editor of the Pan-Pacific Entomologist

Article III, Section 2: At the regular fall meeting in the early part of September, a nominating committee of three members shall be appointed

Amended wording

The members of the Executive Board shall consist of the chairmen of standing committees, the officers of the Society, and the editor (*or one of the editors*) of the Pan-Pacific Entomologist

At the *last regular meeting prior to the annual meeting*, a nominating committee of three members shall be appointed

Article V, Section 1: The Publication Committee, Program Committee, Historical Committee, and Membership Committee shall be known as standing committees, members to be appointed by the president when vacancies occur. Chairman shall be elected by the members of each committee from its own membership.

Article V, Section 2, paragraph 2: The Publication Committee shall appoint an editorial board for the Pan-Pacific Entomologist consisting of an editor, assistant editor, two members of the Publication Committee to act in an advisory capacity to the editor, and such additional members as are deemed necessary.

Article VI, Section 8: All members, except for student members or as herein otherwise provided shall receive the publications of the Society with no additional charge.

Article VII, Section 1: At least four regular meetings shall be held each year, preferably *on the first Saturday of September, December and March* with an annual Field Day during April or May.

The Publication Committee, Program Committee, Historical Committee, and Membership Committee shall be known as standing committees. *Unless otherwise specified in the By-Laws the membership of these committees shall be reviewed by the president every five years, at which time he is authorized to recommend to the Executive Board such changes as may be deemed necessary. Committee vacancies occurring in the intervening period may be filled by presidential appointment, subject to confirmation by the Executive Board at its next regular meeting.*

The Publication Committee shall appoint an editorial board for the Pan-Pacific Entomologist consisting of an editor (or editors) and such associate and assistant editors and advisory members as may be deemed necessary.

All members, except for student members or as herein otherwise provided shall receive the *regular* publications of the Society with no additional charge.

Delete: "on the first Saturday of"
Add: "with two in the fall and two in the spring."

Dr. Hurd reported that beginning with the January, 1951, issue, the Pan-Pacific Entomologist would be printed on super-coated paper which would permit the reproduction of halftone illustrations. The changed format of the front cover was also mentioned.

President Usinger appointed a committee composed of Dr. Pritchard, Dr. Laura Henry and Dr. Edwards to arrange for the annual field meeting of the Society.

The President then called for notes and exhibits. Mr. Adams displayed specimens of *Balmes terissinus* Navas, collected in Yunnan Province, China. This species belongs to the very rare neuropteroid family Psycopsidae which is known from Australia, Asia and East Africa.

Dr. Doult discussed an interesting parasite of the citrus mealy bug which Harold Compere had sent from Kenya Colony in Africa in 1947. This species, *Tropidophryne melvillei*, is normally thelytokous, producing mainly females generation after generation and only occasionally bearing males. Many of the males become intersexes, starting genetically as males and gradually changing toward females. This parasite also exhibits the rare phenomenon of autonar-

cosis. If a large number of them are placed together in a vial they give off a volatile substance which anesthetizes them. Later they recover and thereafter they never again produce the substance.

Mr. Gillaspy reported that positive phototropism is a response of the immature stages of insects as well as of the adults. Both at Clear Lake, Lake County, and at ponds in eastern Santa Clara County, immatures, along with numerous adults, were attracted to Coleman lanterns placed in shallow water or over the surface of the water. Specimens were collected by means of a strainer as they swam close to the light. Immature forms of Ephemera, Odonata, Chironomidae, Coleoptera, and various Hemiptera were collected in this manner. This may offer a convenient and previously unexploited means of obtaining material.

Dr. Ray F. Smith, of the University of California, was introduced as the main speaker of the meeting. His talk, entitled "Entomological Observations in Mexico," was illustrated with many colored pictures. A summary of his remarks is given below.

Dr. Smith reviewed his recent trip to Mexico to study the ecology of *Diabrotica* and related genera. He travelled over 17,000 miles in Mexico in the company of his family. *Diabrotica* are far more abundant and the species far more widespread in northern Mexico than previous records indicate. The thousands of beetles collected by this expedition enlarge the range of nearly every species known north of Mexico City. The Cucurbitaceae have long been considered as the primary hosts of *Diabrotica*. It is now apparent that there are several distinct food preferences in the group. A few are apparently restricted to cucurbits, but the major portion of the genus is associated with perennial grasses and a few others are confined to mints.

Following a discussion of Dr. Smith's talk, the meeting was adjourned.—D. D. Jensen, *Secretary*.

Two Hundred and Sixteenth Meeting

The two hundred and sixteenth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on March 17, 1951, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Usinger conducted the meeting. The following members were present: Gordon G. Marsh, F. X. Williams, J. W. Green, S. G. Watkins, P. H. Arnaud, Lynne Scott, E. O. Essig, W. C. Bentinck, Alexander Hubert, Otto W. Graf, Jr., E. G. Linsley, R. F. Smith, C. Don MacNeill, L. R. Gillogly, P. D. Hurd, Jr., T. W. Cook, W. C. Day, E. C. Van Dyke, R. L. Usinger, J. W. MacSwain, H. B. Leech, and J. Gordon Edwards. Visitors were present as follows: J. Robert McClintic, H. H. Meyer, J. W. Chapman, Marie Essig, Lucy Castro, Grace MacNeill, and Mary Cook.

The membership committee proposed and the Society elected Elwood S. McClusky as a new member.

Dr. Edwards reported that Alum Rock Park had been selected as the site for the annual field meeting of the Society which will be held April 22, 1951.

In response to the President's request for notes and exhibits, Dr. Van Dyke displayed a box of Coleoptera from the Michelbacher-Ross expedition to South America.

Dr. Edwards exhibited a long series of *Scolytus multistriatus* collected at San Jose. This species is known to carry the fungus causing the destructive Dutch Elm disease. Dr. Chapman stated that he had first reported the collection of this species in North America in *Psyche* in 1910.

The president then introduced as the main speaker of the day Dr. James W. Chapman, Chairman of Science Faculty, Emeritus, Silliman University, Duamguete, Oriental Negros, Philippine Islands, who presented three films dealing with Philippine insects. The films had been taken by Mrs. Bierre Brues, on Negros Island.

Dr. Chapman stated that he had made a study of the army ants of the genus *Aenichtus* which have numerous beetles, flies, cockroaches and Collembola associated with them in nature. However, it had been impossible to photograph them in their native jungle habitat.

Pictures were shown of several genera of Philippine ants illustrating their activities and their nesting habits. Nests were shown in twigs, among leaves, in stumps, etc. Of great interest were the pictures showing the manner in which adults of the leaf-nesting species use their larvae to tie leaves together by means of the larval silk.

The second film depicted mound-building termites whose mounds were built of excreta. These termites prepare a compost from undigested wood which is worked into a comb-like structure in which the fungus mushroom gardens are maintained. The termites keep the fungus cut back. When the same fungus grows outside of the colony it matures into edible mushrooms about 2 inches in diameter.

A third film presented pictures of a variety of miscellaneous insects such as bees, wasps, Lepidoptera, and spiders, millipedes, and scorpions.

After some discussion following the films the meeting was adjourned.—J. W. MacSwain, *Secretary pro tem*.

Two Hundred and Seventeenth Meeting Alum Rock Park, April 22, 1951

The two hundred and seventeenth meeting of the Pacific Coast Entomological Society was held as the annual field meeting at Alum Rock Park, Santa Clara County, California, April 22, 1951.

The recorded attendance of 31 persons included 12 members and 19 visitors. Members were present as follows: Otto W. Graf, Jr., J. Gordon Edwards, J. W. Tilden, A. E. Pritchard, R. L. Usinger, P. H. Arnaud, W. W. Middlekauff, D. P. Furman, J. W. Green, E. G. Linsley, J. W. MacSwain, and P. D. Hurd, Jr. The following visitors were present: Anne Minaker, Hazel Tilden, Alice Edwards, Martha Usinger, Juanita Linsley, Jane MacSwain, Sherill Hurd, Phyllis Middlekauff, Marian Sylvester, E. S. Sylvester, E. C. Broadwell, Donald Dye, Marquerite E. Arnaud, Kay Furman, Joan Linsley, Alyce Vilberme, Ruth Green, Mrs. J. W. Green, and Robert Hendrickson.

The weather was very good and the field day was enjoyed by all members and visitors in attendance.—J. W. MacSwain, *Secretary pro tem*.

Two Hundred and Eighteenth Meeting

The two hundred and eighteenth meeting of the Pacific Coast Entomological Society was held at 7:30 p.m. on May 18, 1951 in the entomological laboratories of the California Academy of Sciences, San Francisco, President Usinger in the chair. The following members were present: Edgar A. Smith, J. G. Edwards, E. O. Essig, A. E. Michelbacher, C. P. Hoyt, J. P. Harville, W. C. Bentinck, E. L. Kessel, K. F. Innes, Jr., J. H. Freitag, E. C. Van Dyke, W. W. Middlekauff, H. B. Leech, J. W. Green, L. R. Gillogly, P. A. Harvey, E. G. Linsley, R. L. Potts, D. D. Jensen, G. A. Marsh, and R. L. Usinger. Visitors were present as follows: Donald J. Burdick, A. L. Johnston, Alice Edwards, H. H. Meyer, Mrs. L. R. Gillogly, James M. Linsley, Juanita M. Linsley and Joan Linsley.

The minutes of the meetings held February 16, March 17 and the field meeting held April 22 were read and approved.

The following were elected to membership in the Society: Joe Diaz, W. Lutz, Richard B. Selander, George F. Edmunds, and John Helfer.

Dr. Edwards exhibited the 14 drawings submitted in the contest sponsored by the Society for an appropriate seal for the Society. After the entries had been examined by the members present a vote by secret ballot was taken and the drawing submitted by Mrs. L. R. Gillogly, of Sacramento, received the majority of votes and was declared the winner. A complete set of the Pan-Pacific Entomologist was awarded to Mrs. Gillogly as the prize.

President Usinger reported that the historical account of the Society during its first fifty years had been completed and was ready for publication.

President Usinger reported that the date for the semi-centennial meeting of the Society had been tentatively scheduled for Saturday, September 29, 1951 at 2:00 p.m. A formal meeting will be held in the new auditorium of the Academy. This will be followed by "open house" in the entomological laboratories where historical material of the Society will be exhibited and refreshments will be served.

The President appointed the historical committee to arrange for the exhibits. A special committee was appointed to handle arrangements and refreshments at the Academy consisting of the following: Dr. and Mrs. E. L. Kessel, co-chairmen; Mr. Gustafson, Mr. Leech, Dr. Ross, Dr. Harvey and Mr. Green.

President Usinger reported that a gavel, made out of well-seasoned California Laurel, *Umbellularia californica*, had been made by Mr. John Simons and would be presented at the September meeting.

President Usinger reported that the Society's first memoir, "The Sucking Lice" has been edited and is being varityped for publication.

The question was raised as to whether the memoirs should be provided free on the Society's exchange list and after some discussion it was decided they should not be free. It was also decided that a booksellers' discount of 15% would be given to commercial book dealers.

A motion was made by Mr. Potts and passed by the members present that Dr. Norman Frazier and Mr. Elwood C. Zimmerman be authorized to serve as

official representatives of the Society at the IXth International Congress of Entomology to be held at Amsterdam, Holland, August 17-24, 1951.

In response to the President's call for notes and exhibits, Dr. Edwards displayed specimens of *Priacna serrata*, of the family cupesidae which were attracted in great numbers to soap ("Super Suds") used in a wash in Glacier National Park during the summer of 1950. The beetles appeared to be mating, but all were males. Apparently the soap attracts and stimulates the males in a manner similar to that caused by females.

Mr. Potts reported that a pest control operator had brought in Melyridae beetles, *Listrus motschulskii* (LeConte), which were attacking newly developing strawberries in the vicinity of Palo Alto. The species is not native to the United States. Dr. Van Dyke stated that most beetles in this family feed on pollen.

Dr. Kessel exhibited specimens of balloon flies which represent the third species of *Empis* found in Marin County. They were taken at Novata, April 11, 1951, and included several mating pairs.

The president then introduced as the main speaker of the meeting, Mr. R. W. L. Potts, of the California Department of Agriculture, who presented an illustrated lecture on "Collecting on Truk and Ponape." A summary of Mr. Potts' remarks is given below.

A general collecting expedition, lasting four months, was made to the Truk area and Ponape in the Eastern Caroline Islands, under the auspices of the Insect Control Committee of the Pacific Science Board, National Research Council, with financial assistance from the Office of Naval Research. The purpose was to collect as representative a lot of insects as possible in the Truk area to help further the understanding of insect distribution in the oceanic islands of the Pacific.

Truk consists of fifteen volcanic islands and over two hundred coral islets in and around a lagoon some thirty-five miles across. The total land area is just over thirty-seven square miles. The climate is quite moderate, tempered by the nearly continuous light trade winds and frequent rains, which average about five to ten inches precipitation per month, with little or no seasonal variation. The native population is considerable, with just under 10,000 people, approximately one-fifth the total population of the entire Trust Territory of all the Carolines, Marshalls, and Marianas Islands. During the war more than 10,000 Japanese were also stationed on these islands of Truk. As a result, almost the entire land area is or has been in recent cultivation and the native flora is restricted to very small mountain cliff areas. Two further restrictions upon a native insect fauna are placed by an introduced vine *Ipomoea* which has largely taken over the mountain areas, even extending heavily over cliff faces, and by the extremely abundant ant population of a number of pest species.

Collections were made on Moen, Tol, Dublon, Param, Falo, Romanum and Fono Penges among the volcanic islands and at Pis, the largest coral islet. Short exploratory trips with some collecting were made to Nama, an isolated coral islet about sixty-five miles from Truk, and to the large volcanic island of Ponape. About 15,000 insects were collected, but it is expected that the number of endemic species will be rather small.

About 100 color slides were shown, illustrating the various islands visited.

Following a discussion of Mr. Potts' talk the meeting was adjourned.—
D. D. Jensen, *Secretary*.

Two Hundred and Nineteenth Meeting
(Semicentennial Program)

The two hundred and nineteenth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on September 29, 1951 at the California Academy of Sciences, San Francisco, and commemorated the 50th anniversary of the organization of the Society. President Usinger presided over the meeting. In attendance were 61 members and 22 visitors. The following members were present: E. S. Ross, E. C. Zimmerman, E. O. Essig, J. W. Tilden, Edgar A. Smith, J. P. Harville, A. C. Smith, Alice Eastwood, R. C. Miller, Charles L. Scott, Victor Stompler, William Hazeltine, R. R. Snelling, J. Stage, E. R. Leach, N. A. Lewis, Ruth C. Whitney, Frieda Abernathy, C. P. Hoyt, P. H. Arnaud, N. D. Waters, K. F. Innes, Jr., Paul A. Harvey, T. W. Cook, C. D. MacNeill, W. H. Lange, J. W. MacSwain, E. C. Van Dyke, L. R. Gillogly, R. P. Allen, A. E. Pritchard, W. D. Murray, J. F. Gustafson, H. M. Armitage, J. E. Gillaspy, W. V. Garner, W. C. Bentinck, Harry L. Hansen, Larry W. Quate, R. F. Smith, R. L. Douth, E. E. Gilbert, K. S. Hagen, H. B. Leech, W. C. Day, S. G. Watkins, C. A. Downing, G. A. Marsh, Benjamin Keh, E. G. Linsley, W. W. Sampson, D. P. Furman, J. H. Freitag, J. R. Helfer, Robert Potts, W. Lutz, R. L. Usinger, J. D. Lattin, C. D. Duncan, J. G. Edwards, and D. D. Jensen. The following visitors were present: Mrs. K. Innes, Jr., Mrs. C. D. MacNeill, R. F. Johnston, Pauline S. Lange, Mrs. L. R. Gillogly, Alan Gillogly, James Gillogly, Keith H. Kellzom, Walter Thomson, Frances Leech, Herbert Meyer, E. Bodwell, Janice Downing, W. P. Horen, S. J. Rutherford, Barbara Prendergast, James Linsley, Joan Linsley, Juanita Linsley, Mrs. E. C. Zimmerman, Geraldine R. Potts, and Michael Potts.

Before the meeting was called to order in the Morrison Auditorium, a picture was taken of the attending members and visitors on the front steps of the Leslie Simson African Hall.

The following were elected to membership in the Society: Harry L. Hansen, William V. Garner, David Cox, Edward E. Gilbert, John D. Lattin, Dr. Donald De Leon, Jerome G. Rozen, L. J. Stage, Harold E. Stark, Walter Thomsen, and William Wall.

President Usinger appointed Mr. Leech, Mr. Green and Dr. Ross to serve as a committee to audit the Society's financial records and report at the annual meeting in December.

Mr. Day, Dr. Furman and Dr. Tilden were appointed as a committee to nominate a slate of proposed officers for the year 1952 at the December meeting.

President Usinger reported that the first volume of the Society's new "Memoirs Series," "The Sucking Lice" by Professor Ferris, was off the press and would be bound and ready for distribution within a short time.

President Usinger reported that Dr. E. C. Van Dyke was the only one of the charter members of the Society who was present at the semi-centennial anniversary program. The only other living charter member is James E. Cottle

of Hayward, California. He also called attention to the presence of Miss Alice Eastwood who joined the Society in 1902, one year after its founding. Dr. Francis X. Williams, who joined the Society in 1904, is still an active member but was not present.

President Usinger then called on Dr. Van Dyke, Honorary President of the Society, to conduct the meeting.

Dr. Van Dyke expressed his pleasure at being present for the occasion and called on Mr. Elwood C. Zimmerman, Entomologist of the Hawaiian Sugar Planters' Association Experiment Station, who presented an address on 'The Origin, Development and Decay of Oceanic Islands.' Mr. Zimmerman's interesting talk, which was illustrated with an excellent motion picture in color of the spectacular volcanic eruptions in Hawaii, is summarized below.

The development of any biota is fundamentally linked with the geological history of the land. The mode of origin, development and decay of oceanic islands with the accompanying development and decline of their biotas, presents us with many remarkable histories of ecology and organic evolution in a condensed and fascinating manner. The Hawaiian archipelago is composed of typical oceanic islands. It consists of a great line of volcanic peaks extending across the mid-Pacific for a distance as great as that from Canada to Cuba. They have risen as masses of boiling rock from the interior of the earth and have burst sterile through the barren sea. They have never been connected to any other land. They have grown by volcanic outpourings to heights of as much as 14,000 feet above sea level and rising from ocean depths as great as 18,000 feet below sea level. The great processes of erosion have, and are, degrading the mountain masses at a surprisingly rapid rate since the volcanic fires have ceased upbuilding, and the islands are in progressive stages of being worn away and returned to the sea. Some of the old leeward islands have been completely eroded to below sea level and their tops are now capped by coralline materials and are called atolls. (This cycle of birth, development and decay was illustrated with slides and a colored cinema of recent volcanic activity of Mauna Loa, Hawaii.)

The terrestrial plants and animals of these oceanic islands are the descendants of ancestors which were transported across the open sea. The agencies of transport include the ocean currents, winds, and aid from other organisms, including man. The overseas barriers have exerted a selective influence upon the types of plants and animals which have succeeded in crossing the ocean and becoming established. Thus, in Hawaii there are no endemic species of land reptiles, amphibians, mammals, cockroaches, mantids, earwigs, stoneflies, mayflies, caddice flies, scarabs, leafbeetles and many other groups which are present on all of the continents. There is an unusual evolutionary development of some of the groups of organisms which have succeeded in becoming established, however. For example, the greatest concentration of the *Nysius* bug complex occurs in Hawaii. There are more than 100 species of *Odynerus* wasps there, and it is possible that there are more than 200 kinds of *Drosophila* in this area which is less than that of Massachusetts.

At the conclusion of Mr. Zimmerman's talk the meeting was adjourned to the Entomological Laboratories of Leslie Simson African Hall where an

open house was held and refreshments served. On exhibit were many of the Society's books, records, pictures and other material of historical interest.—D. D. Jensen, *Secretary*.

Two Hundred and Twentieth Meeting

The two hundred and twentieth meeting of the Pacific Coast Entomological Society was held at 7:30 p.m. on November 9, 1951 in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President Usinger in the chair. The following members were present: E. S. Ross, W. Harry Lange, A. E. Michelbacher, W. C. Day, D. D. Jensen, E. O. Essig, Theodore Aarons, F. E. Skinner, J. W. Green, Gordon Marsh, C. A. Downing, D. P. Linsdale, S. G. Watkins, N. W. Frazier, Herbert H. Meyer, K. F. Innes, Jr., H. L. Hansen, W. C. Bentinck, W. V. Garner, E. E. Gilbert, E. R. Leach, J. P. Figg-Hoblyn, P. H. Arnaud, Victor Stomblor, Norman Lewis, Wm. Hazeltine, J. G. Rozen, C. D. MacNeill, M. Marquis, L. R. Gillogly, H. B. Leech, E. L. Kessel, T. R. Haig, Jr., Lee A. Wood, Jr., J. G. Edwards, K. S. Hagen, and R. L. Usinger. Visitors were present as follows: A. Johnston, P. S. Johnston, H. L. Day, Ruth Ogren, James Balch, R. Morgan, C. E. Bodwell, Peggy Figg-Hoblyn, George Lindsay, Maxine Hagen, Mrs. L. R. Gillogly, and J. Galen.

The minutes of the semicentennial meeting held September 29, 1951, were read and approved.

The following were elected to membership in the Society: Thomas R. Haig, Jr., Charles P. Alexander, Herbert H. Meyer, and Lee A. Wood, Jr.

President Usinger announced that at the Annual Meeting, to be held in December, reports were to be given by all committees as well as an annual report of the Treasurer. The auditing committee and the nominating committee, appointed at the September meeting, were reminded that they were to report at the December meeting.

In response to the President's call for notes and exhibits, Professor Essig circulated a new book by F. S. Bodenheimer, entitled "Insects as Human Food."

Dr. Edwards reported that the drawing selected as the winner in the contest for an official seal had been recovered after being lost in the mails for several weeks.

Mr. Leech reported the death, at the age of 80 years, of J. O. Martin, Secretary during the years 1928-1935.

The President then called on Dr. A. E. Michelbacher, of the University of California, and Dr. E. S. Ross, of the California Academy of Sciences, for reports on their joint collecting expedition in western South America. Both talks were illustrated with excellent kodachrome pictures. Dr. Michelbacher spoke first on "Entomological Impressions of Southwestern South America." A summary of his remarks follows:

Many of the entomological problems in southwestern South America are similar to those in California. In many cases the same species of insects, or closely related ones, are involved. The insect problems in Chile appeared to be more like those found in California than those occurring in Peru. The

absence of killing frosts over much of the agricultural area in Peru results in ecological conditions far different than those encountered in our state. This climatic difference makes it rather difficult to compare the entomological problems of the two areas, in spite of the fact that many species occurring in both regions are the same or closely related.

Chile might well be called the land of the weevils. They were encountered everywhere and as destructive pests they are only outranked by the sucking insects. In Chile many ecological zones similar to those found in California were encountered. The dominant flora in many localities was the same as introduced into California, and often it was necessary to search for native plants and insects for proof that we were in a foreign land.

In Argentina we were impressed by the large swarms of grasshoppers. In one locality the sky as far as the eye could see was full of them flying westward towards the setting sun. Some of the desert region of western Argentina was like certain California deserts, and any comparative insect faunal study between California and South America must include the eastern as well as the western slopes of the Andes.

Our trip through the Alta Plana of Bolivia and Peru will probably be best remembered for cold nights and insect collecting pretty well limited to those that could be found under rocks.

Dr. Ross discussed 'Impressions on the Biogeography of Western South America.'

Southward from the Guayaquil gulf of Ecuador the climate and biota of the Pacific slope of the Andes is strongly influenced by the cold Humboldt Current and the blocking of the rain-bearing southeasterly trade winds by the high Andean range. Thus, the entire Pacific Coast of Peru is desert except for irrigated valleys. The desert conditions continue southward as far as north central Chile where a gradual increase in winter rain fall is encountered as one moves southward. This condition increases until many ecological conditions become parallel to those of the Pacific Coast of North America but prevailing in a reverse direction.

In the California-like zone of Central Chile there is a mixture of xerophytic plant life, cacti, *Prosopis*, etc., which, as in California is derived from the Neotropical region, and a southern temperate flora having more affinities with that of New Zealand and Australia than to that of the remainder of South America. Southward this temperate flora dominates the scene and, together with the highly endemic animal life, constitutes, in spite of its small geographic area, one of the major biotic zones of the world. It is thus a mistake to classify all of South America as Neotropical for the Patagonian area is just as distinct from it as the Nearctic is in North America.

Dr. Ross remarked that Argentina should be of greater interest to North American students because of its ecological conditions paralleling those of northeastern Mexico and the gulf coast of Texas. The desert in the state of Mendoza was found to be highly reminiscent of our own Colorado desert.

The large collection of insects now available at the California Academy of Sciences should, as it is studied by specialists, throw much light on relationships between the faunas of North and South America.

At the conclusion of the talks the meeting was adjourned.—D. D. Jensen, *Secretary*.

Two Hundred and Twenty-first Meeting

The two hundred and twenty-first meeting of the Pacific Coast Entomological Society was held at 7:30 p.m. on December 7, 1951, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President Usinger conducted the meeting. The following members were present: A. E. Michelbacher, W. W. Middlekauff, H. H. Meyer, E. L. Kessel, E. C. Van Dyke, G. F. Ferris, E. S. Ross, E. E. Skinner, P. H. Arnaud, A. E. Pritchard, Walter Thomsen, L. A. Wood, M. D. Murray, J. G. Rozen, Jr., H. B. Leech, W. C. Day, E. O. Essig, and R. L. Usinger.

Dr. D. G. Denning, Robert Morgan and James Balch were elected to membership in the Society.

Dr. Ross was appointed secretary *pro tem*. Dr. Miller read the Treasurer's report, which was approved by vote of the members present.

Dr. Ross, chairman of the auditing committee, reported that the Society's financial records had been examined and found to be in good order.

Dr. Usinger announced that the Society's new seal was ready and invited discussion regarding its use in the Pan-Pacific Entomologist. Dr. Pritchard moved that the editorial board be empowered to decide on the position of the seal in the Society's publication. The motion carried.

Discussion was opened regarding a new contract for printing the Pan-Pacific Entomologist. Mr. Leech reported that a bid had been received from a San Francisco firm for \$10.00 per page. Dr. Kessel suggested changing printers but not the typesetter. No formal action was taken.

The President then called for notes and exhibits. Professor Ferris displayed some of the plates for volume 6 of his scale atlas.

Mr. Hoyt exhibited his drawing of a Chilean neuropteroid (Neuroptera) having dipterous head characters.

Mr. Day, chairman of the nominating committee, proposed and the Society elected the following officers for 1952: E. O. Essig, President; J. W. MacSwain, Vice-President; D. D. Jensen, Secretary; R. C. Miller, Treasurer.

The chairmanship of the meeting was then turned over to President-elect Essig, who called on Dr. Usinger to give his retiring presidential address entitled "The Role of Type Specimens in Taxonomy and Nomenclature."

The position was taken that type specimens can only be specimens upon which descriptions or figures are based. With this as a premise it was concluded (1) that it is the specimen upon which the figure is based that is the type, not just the figure; (2) that a type locality must be the place from which an actual specimen was collected and cannot be restricted to a place inconsistent with existing evidence as to the place of collection; and (3) that neotypes should be recognized officially, but only if designated in connection with a description *in words*, thus conforming to the revised version of Article 25 of the International Rules of Zoological Nomenclature.

Following a lively discussion of Dr. Usinger's address the meeting was adjourned.—E. S. Ross, *Secretary pro tem*.

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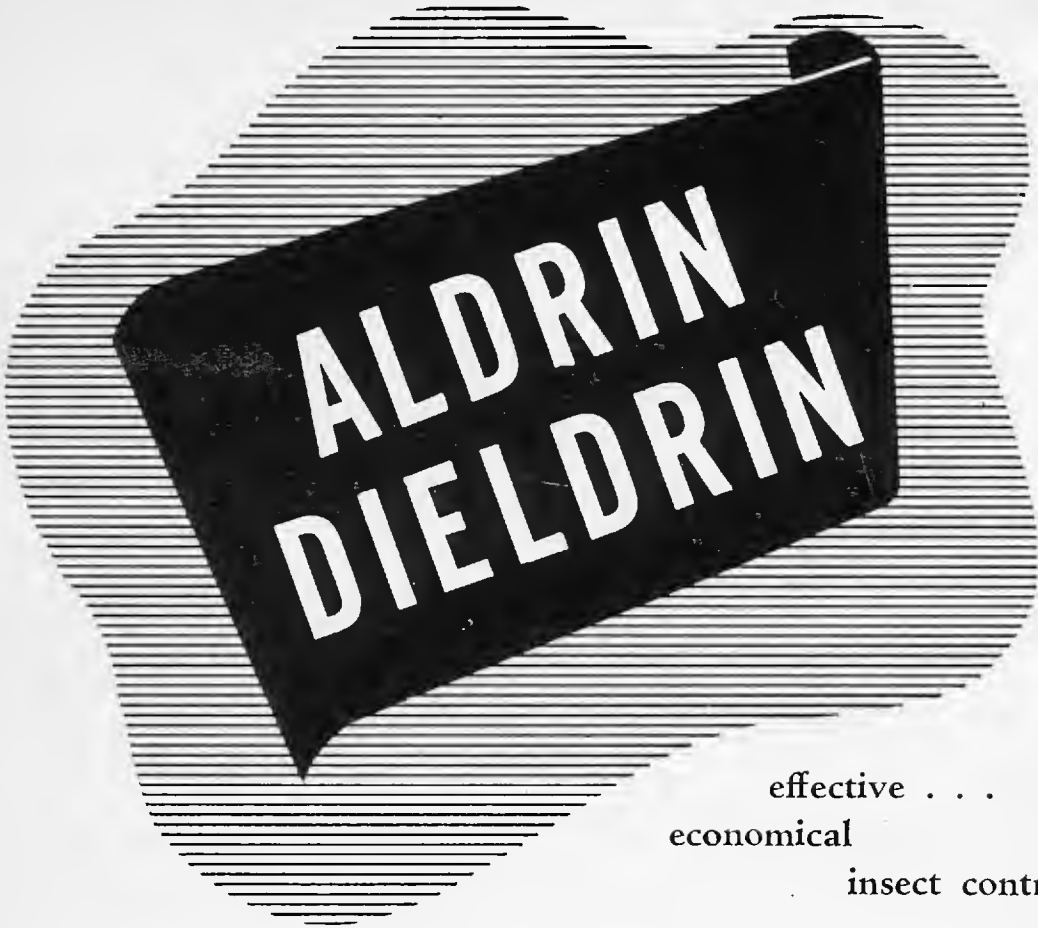
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BULLETIN OF ZOOLOGICAL NOMENCLATURE

Arrangements have been made for completing volume 1, and for the publication of volumes 2 (applications in regard to nomenclatural problems), 3 (documents considered by the International Commission on Zoological Nomenclature at Paris, 1948), 4 (Official Record of the International Commission at Paris), and 5 (Official Record of the section on Nomenclature of the thirteenth International Congress of Zoology at Paris, 1948).

All inquiries regarding publications should be addressed to: International Trust for Zoological Nomenclature, 41 Queen's Gate, London, S. W. 7, England.

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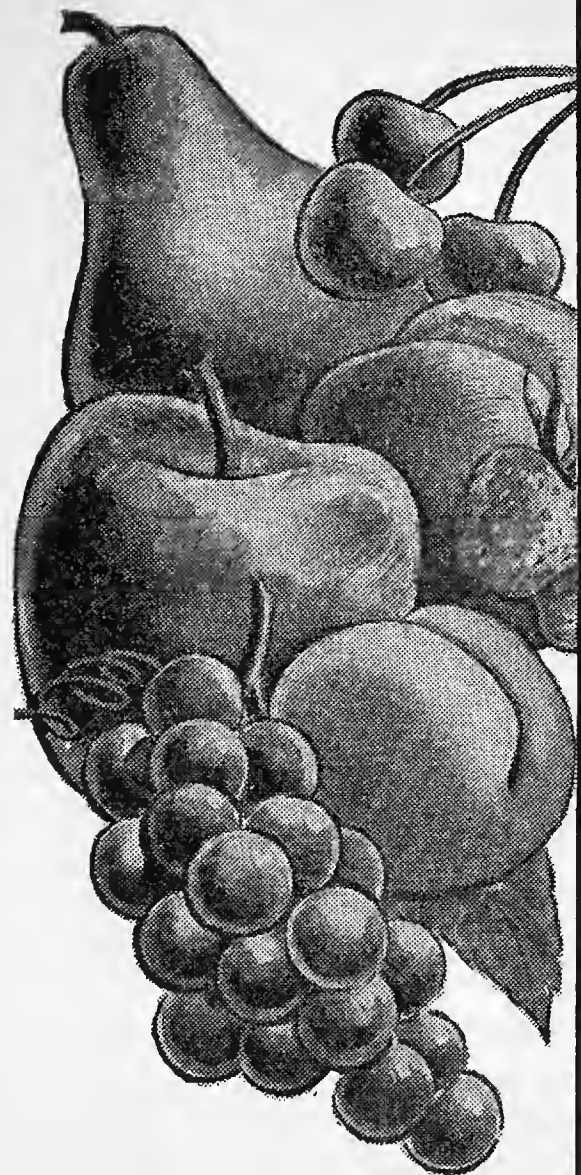
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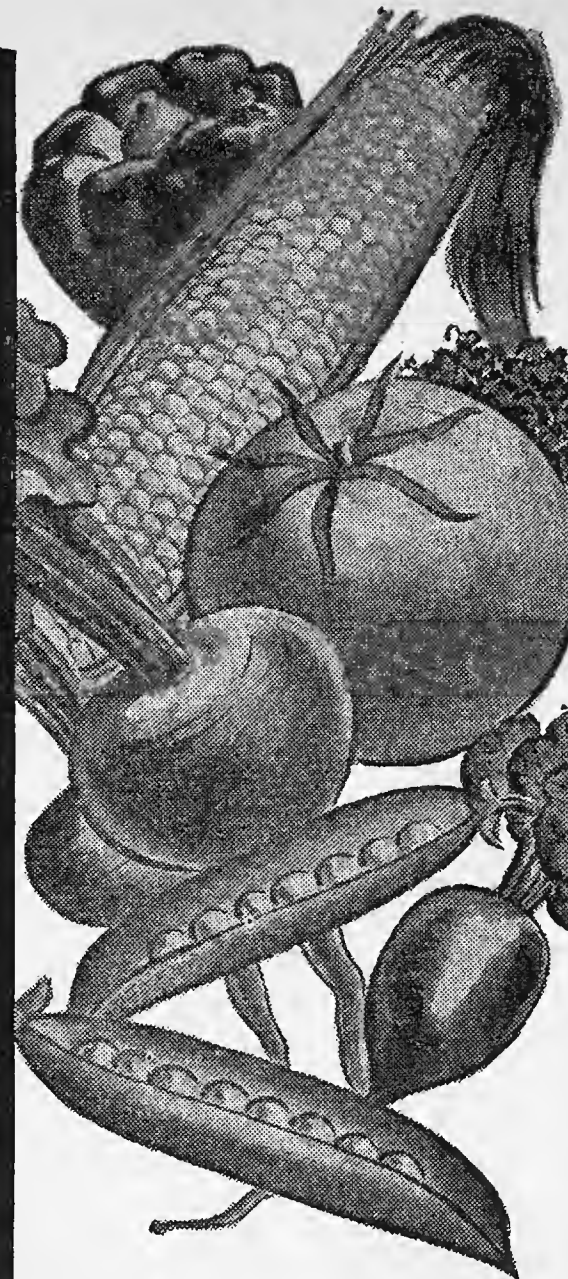
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The Pan-Pacific Entomologist

Vol. XXVIII

April, 1952

No. 2

JAMES OTIS MARTIN



James Otis Martin, a member of the Pacific Coast Entomological Society since 1919 and its Secretary from 1928-35, passed away on October 15, 1951 at the home of his daughter, Mrs. Frederick J. Adams, in Austin, Texas. He was 81 years old and had been a resident of Austin for eight years since the death of his wife, Emily Ferry Martin, in Berkeley in 1943. Survivors include his daughter and a grandson, Robert Martin Adams of San Antonio, Texas. Funeral services were held in Austin and his ashes were buried beside those of his wife in Sunset View Cemetery, Berkeley, California.

J. O. Martin was born in Chicopee, Massachusetts, May 18, 1870, the son of William Henry and Silence Hoskins Martin. He

attended Chicopee High School and Mt. Herman School at Gill, Massachusetts. After spending three years as an apprentice in the Navy, he enrolled at Pratt Institute in Brooklyn where he studied mechanical drawing and machine design. He later attended Cornell University earning the B.S. and the M.S. degrees. At Cornell Mr. Martin was an assistant to Professor Ralph S. Tarr and made many of the photographs which were to serve as illustrations in the famous Tarr and McMurray geographies. His thesis problems in entomology involved the biologies of *Hydrometra martini* Kirkaldy and of *Silpha* and *Necrophorus*.

Martin's interest in insects was first aroused at the age of 12, when he was walking in a cemetery one Sunday afternoon and saw a man and boy turning over grave stones. Upon investigation he found that they were collecting bombardier beetles. The boy was Frederick Knab and the man, Knab's father. James Martin and Frederick Knab subsequently became good friends and made many collecting trips together. His intense interest in collecting beetles started at that time and was maintained throughout his life.

In the summer of 1896, Martin went to Greenland on an expedition sponsored by Cornell University and Massachusetts Institute of Technology. He had the interesting experience of travelling with Peary who was returning to Greenland for a 40 ton meteorite which he had been unable to bring out the previous year. The expedition was headed by Professor Ralph S. Tarr and, although the principal object was a geological study of Greenland, Martin had the assignment of collecting natural history materials, especially plants, insects and anthropological objects. He also acted as expedition photographer, operating with the greatest difficulty as he had to use a drygoods box as a dark room.

In 1913, Martin came to Pasadena, California. There he met H. C. Fall, who interested him in the myrmecophilous histerids of the genus *Hetaerius* and told him where to find them in the Arroyo Seco where the Rose Bowl is now located. Subsequently Martin published two valuable systematic papers on this genus and never missed an opportunity to collect additional specimens.

In 1918, he moved to Berkeley and availed himself of the opportunity of taking additional graduate work at the University of California. Under the direction of Professor E. C. Van Dyke while

attending the University, he made an important but unpublished study of the insect inhabitants of wood-rat (*Neotoma*) nests. Subsequently he lived in Berkeley until 1943.

Martin collected extensively in New England, Alabama, and southwestern United States. He was especially fond of the deserts of southern California, Arizona, New Mexico and Texas. He spent half a dozen summers collecting in these areas, one with E. P. Van Duzee, two with E. G. Linsley, the remainder alone¹. The material collected on these trips was presented to the California Academy of Sciences and forms an important part of the collections from this region. He was a good companion in the field, a fine camper, good hiker, excellent cook and able to "take it" without complaining under difficult and trying conditions.

Throughout most of his life, entomology was an avocation with Martin. However, in 1924, he joined the staff of the Department of Entomology at the California Academy of Sciences as a preparator. He served in this capacity until 1932, when he retired from active entomological work. In later years he devoted much of his time to other hobbies, particularly stamp collecting, fishing, and the building of out-board motor boats.

Martin once recalled that Professor John Henry Comstock had a profound influence in shaping his life and interests as did H. C. Fall. He made a number of camping-collecting trips with Fall, who helped him with his identifications in the early days of his work in the West.

Martin's early collection of 12,000 specimens of meticulously prepared beetles, mostly from western North America, was presented to the California Academy of Sciences in 1928. It was especially rich in the less conspicuous and lesser known groups of Coleoptera.

Mr. Martin was especially fond of beginners who were in their first enthusiasm for entomology. He helped many by giving them equipment, insect boxes, and actually taking them on collecting trips. This was especially true of the writer who in high school and early college days made several field trips with him throughout

¹For notes concerning field activities of J. O. Martin, see Pan-Pac Ent. 2:47; 3:46,152; 4:48; 5:48, 192; and 18:46.

California, Arizona, New Mexico and Texas, much of the time wholly or partly at Martin's expense. Later, Martin presented him with a case of 50 Schmitt boxes, a label printing press, certain entomological books, a complete set of H. C. Fall's papers on the Coleoptera, and many other helpful entomological materials which he could not then afford to buy. Scattered throughout the country are biologists who could make similar statements concerning the generosity and encouragement offered by Mr. Martin.

The list of J. O. Martin's entomological writings is not long but it reflects to some extent the diversity of his taxonomic interests. However, he will long be remembered for the valuable collections which he made in the course of a long life and the encouragement and help which he gave to younger students of entomology.—E. G. LINSLEY.

ENTOMOLOGICAL WRITINGS OF J. O. MARTIN

- 1900. A study of *Hydrometra lineata*. Can. Ent., 32:70-76, pl. 3, figs. 7-8.
- 1917. In quest of *Dinapate wrightii*. Bull. Brooklyn Ent. Soc., 12:107-110, pl. 1.
- 1919. Notes on the occurrence of *Schizax senex* in California (Col., Cerambycidae). Ent. News, 30:231-232.
- 1920a. Notes on the genus *Hetaerius* and descriptions of three new species (Coleop.) Ent. News, 31:222-225, 245-248.
- 1920b. A new California *Methia*. Can. Ent., 52:215-216.
- 1922. Studies in the genus *Hetaerius* (Col. Histeridae). Ent. News, 33:272-277, 289-293.
- 1924a. Studies in the genus *Mecas* (Coleop.). Ent. News, 35:244-245.
- 1924b. Note on *Hydnobius matthewsii* Crotch (Col.:Silphidae). Ent. News, 35:255.
- 1927. A new *Helmis* (Coleoptera-Helmidae) from the Northwest. Pan-Pac. Ent. 4:68.
- 1928. A new *Triarius* from Arizona. Pan-Pac. Ent., 5:34.
- 1929. A new California *Malachius* (Coleoptera). Pan-Pac. Ent., 5:174.
- 1930a. Notes on the genus *Diodyrhynchus* Sch. with a description of a new species (Coleoptera). Pan-Pac. Ent., 6:129-130.
- 1930b. Two new coleopterous insects from Arizona. Pan-Pac. Ent., 7:70-72.
- 1931. A new *Telegeusis* from Arizona (Coleoptera). Pan-Pac. Ent., 8:91-92.
- 1932a. *Amblycheila* in California. Pan-Pac. Ent., 8:111.
- 1932b. A new California *Epicauta* (Coleoptera, Meloidae). Pan-Pac. Ent., 8:169-170.
- 1932c. *Amblycheila schwarzi*. Pan-Pac. Ent., 8:190.
- 1933. Notes on some longicorns from subtropical Texas (Coleop.:Cerambycidae). Ent. News, 44:178-183. (with E. G. Linsley).

INSECTS ASSOCIATED WITH SEQUOIA SEMPERVIRENS
AND SEQUOIA GIGANTEA IN CALIFORNIA¹

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INTRODUCTION

Many people believe that the coast redwood *Sequoia sempervirens* (Lamb.) Endl. and the giant sequoia *Sequoia gigantea* (Lindl.) Decne are either remarkably resistant to insect feeding or are not fed upon at all. Such, however, does not seem to be the case. A good many insects breed in or on both species of *Sequoia*. There are insects that feed on the foliage, in the thick bark, in the phloem, and in the solid wood. It is true that, when compared with some of the other conifers, the number of species of insects attacking the sequoias is rather small. Just why this is so is not known. It may be that, since the sequoia is a tree left over from past geological ages, most of the insects for which it was originally a host have died out. It is more probable that, like the California nutmeg *Taxus brevifolia* Nuttall, the western yew *Taxodium californicum* (Torrey) Green, and other species of plants, not many insects that feed on sequoias have developed.

Some people believe that the sequoias' supposed repellent or resistant properties are due to chemicals in the wood. Sherrard and Kurth (1933) have shown that there are extractives in the heartwood which prevent growth of certain fungi, but, so far as the writer is aware, no worker has shown that there is a chemical in the living portions of the tree—i.e., the sapwood, cambium, or leaves—which is repellent to insects.

The statement is often made that the sequoias' thick bark pro-

¹The names preceded by an asterisk (*) are new host records. Original notes for several species, kindly furnished by E. G. Linsley, E. C. Van Dyke, and Emanuel Fritz, of the University of California, and H. L. McKenzie, of the California State Bureau of Entomology and Plant Quarantine, are acknowledged under the insects concerned. The biological notes for the other species are from the files of the Forest Insect Laboratory, U. S. Bureau of Entomology and Plant Quarantine, Berkeley, California, and from the writer's notes, made when he was earlier employed by the National Park Service. Other assignments have prevented the completion of this paper, which was interrupted by the writer's entrance into the Army in 1942. Although the literature has not been searched since that date and the references consulted before that date have not been tied into the text, it seems advisable to make this information available to other workers as it is. F. P. Keen, in charge of the Forest Insect Laboratory at Berkeley, attended to the final details of this paper.

fects them from insect attacks, but some insects easily bore through the bark, and one species apparently is able to develop in the bark alone. Moreover, the bark on the upper portion of the bole and on the branches is thin, seldom being over $1/3$ inch thick, and the bark on the lower portions of the bole is so deeply grooved on large trees that in many places the distance from the surface to living tissue is less than 1 inch. As soon as a tree is cut or a limb is broken, it is promptly and heavily attacked through the bark by insects which earlier made no attempt to attack it. Such evidence seems to indicate that a living tree is not attractive to these insects.

The supposed resistance of living trees to insect attack is commonly given as one of the chief reasons for the great age which sequoias attain. However, the western yew and the California nutmeg have fewer insects attacking them, and these two species are not known to live longer than 400 years. The real reason for the great age of the sequoias seems to be that the development of senescent cells in an individual tree is a matter of several hundred years, rather than of decades or shorter periods, as is the case for much plant life. Trees, like other organisms, have life spans that vary in different kinds. Some, such as digger pine and dogwood, are short-lived; others, such as the oaks and sequoias, are long-lived. Some kinds are more heavily beset by insects than other kinds; but, although insects may kill off more individuals of the former than of the latter, the life span of the species is not affected.

Except for several species of scales, all the insects discussed below are native. No other introduced insects are known to attack either species of sequoia. No attempt has been made to list the insects attacking either coast redwoods or giant sequoias that have been introduced into other parts of the world.

COAST REDWOOD INSECTS

BARK BEETLES

The redwood bark beetle *Phloeosinus sequoiae* Hopkins is the most common insect attacking redwood throughout its range. The adult is about 4 mm. long, barrel-shaped, and very dark brown to nearly black. The wing covers of some individuals often remain a reddish brown. The larvae are curved, legless, and whitish, with light brown heads.

The beetles are attracted to weakened and recently felled trees and to injured or broken branches. The attacking beetle, which is

always the female, bores through the bark to the wood and there excavates a tunnel up the tree along the grain of the wood. Eggs are laid on each side of the gallery, and the larvae hatching from them mine out at right angles to the egg gallery. Pupation occurs either in the wood or in the bark. There is apparently little preference in regard to the size of the tree attacked. Trees 6 feet in diameter are infested as readily as limbs less than $\frac{1}{2}$ inch in diameter. In the thick-barked portions the egg galleries are entirely in the bark; in small branches the egg galleries are entirely in the wood.

Winter is passed in the larval, new adult, and parent adult stages. Attacks are made through the warmer months of the year, but the main flight period appears to occur in May. There is considerable variation in the number of attacks per square foot. In one tree 22 inches in diameter the attacks averaged 17 per square foot, but they are usually fewer than this.

As mentioned above, the female beetle initiates the attack and only one pair of beetles is found in each gallery. The egg galleries average about $2\frac{5}{8}$ inches in length. The shortest observed was 1 inch, the longest, 6 inches. Counts made in 11 galleries showed an average of 48 eggs per female. The maximum number observed was 171; the minimum, 36. The incubation period is not definitely known. The larvae require at least 2 months to complete development. There is considerable overlapping of broods, but observations indicate that there are two generations a year.

Thanasimus repandus Horn is a common predator of this beetle. A larva collected in October pupated by November 18 and transformed to an adult between December 1 and 17 of the same year. The adult is about 8 mm. long. The head, legs, and posterior half of the wing covers are black; the pronotum, base of the wing covers, and abdomen are red; a narrow band of white hairs separates the red from the black on the wing covers, and there is a wider band of white hairs across the wing covers near each tip. The predator seems to be restricted to this host, where it also feeds on *Dicentrus bluethneri* LeConte.

Lasconotus vegrandis Horn is fairly common in the egg galleries of the redwood bark beetle. The larvae probably prey on the eggs and young bark-beetle larvae. It is a slightly flattened reddish-brown beetle about 3 mm. long. Each wing cover bears six distinct ridges with a double row of coarse punctures between the ridges except

the outermost one. All the ridges are crested with silvery recumbent hairs.

The following parasites have been reared from limbs infested with the redwood bark beetle:

Heydenia unica Cook and Davis

Doryctes sp.

Eurytoma phloeotribi Ashmead

Rhopalicus sp.

Spathius sequoiae Ashmead

Cecidostiba sp.

Ecphylus californicus Rohwer

In the Hopkins (1903) description of *Phloesinus cupressi*, he mentioned having taken it from redwood. Blackman (1942) also reported a single lot taken from redwood in Alameda County. This beetle normally attacks only *Cupressus macrocarpa*.

**Cryphalus* probably *pubescens* Hopkins is the smallest beetle known to attack this tree, being scarcely 1 mm. long. It is very dark brown. It is found in small injured limbs or ones that have been recently broken off. The adults make small radiating galleries. Specimens have been taken in Muir Woods in March and near Rockport in October. In the literature it is recorded as breeding in *Abies*.

Ips latidens (LeConte) is a brownish, cylindrical beetle with three spines on the declivity. It is about 3 mm. long. The writer has examined a single specimen in the collection of the State Department of Agriculture at Sacramento, taken on May 10, 1934, from an ornamental redwood growing at Placerville, California. This species is most commonly found attacking digger and lodgepole pines.

AMBROSIA BEETLES

**Platypus wilsoni* Swaine is a dark-brown cylindrical beetle with a large head and pointed wing covers. It is about 5 mm. long. Professor Fritz obtained a dead specimen at Samoa, California, from finished lumber in which it had made extensive galleries. Whether it had been breeding in the logs in the field or whether this incidence was merely a case of abnormal attraction to green logs is not known. Normally this species breeds in *Abies*, *Pseudotsuga*, *Tsuga*, and *Picea*. In literature it is also recorded from *Libocedrus*, *Thuja*, and *Pinus*.

Gnathotrichus sulcatus (LeConte) is a slender dark brown cylindrical beetle about 3 mm. long, which commonly breeds in the sapwood of freshly cut stumps and logs. It excavates extensive galleries, which in cross section appear as pin holes, often with stain-

ing around the edges. Adults are found in flight all season long. Attacks generally occur only when the bark is present; consequently, they may be prevented by barking the tree as soon as it is felled. This species also attacks the giant sequoia *Pseudotsuga*, *Abies*, *Chamaecyparis*, *Tsuga*, *Picea*, and *Pinus*.

**Monarthrum scutellare* (LeConte) is a shiny dark-brown cylindrical beetle with its hind end "cut off" at an angle and with prominent teeth at the sides of the cut. It is about 4 mm. long. This beetle commonly attacks oak, but there is one record of its boring into a recently cut log near Garberville. Professor Fritz, who collected the specimens, states: "Piles of white frass were very numerous on tops of logs. First observed, April 26, 1934. Adults busy flying in numbers above the piles and ever so often one would enter a hole in the log." All other records show this species as breeding in hardwoods, chiefly *Quercus*.

Trypodendron cavifrons (Mannerheim) is reported by Kleine (1934) as having been taken from redwood, but this record is not verifiable. It is known to attack *Pinus*, *Picea*, *Alnus*, and *Betula*.

POWDER-POST BEETLES

**Habrobregmus gibbicollis* (LeConte) is a grayish-brown beetle about 4 mm. long, which commonly bores in the damp sapwood of trees that have been dead several years. The galleries of the grubs make a network of fine holes and the wood is reduced to a powdery condition. Larvae have been collected in October. All stages can probably be found at any time of year. This species is also known to feed extensively in *Pseudotsuga*.

**Ptilinus basalis* LeConte is a cylindrical brown beetle with a darker brown head and pronotum. It is about 4 mm. long. E. G. Linsley has identified adults collected by Professor Fritz near Garberville, California, from redwood siding. This beetle commonly attacks the wood of California laurel (*Umbellularia californica* [Hook & Arn.] Nuttall).

CERAMBYCID BEETLES

**Ergates spiculatus* (LeConte) is the largest beetle attacking redwood and is often nearly 65 mm. long, but some specimens are only 40 mm. long. It is dark brown. The lateral margins of the pronotum bear many small spines, although some specimens almost lack these spines. Linsley collected a larva that was boring in the sapwood of redwood and also in *Abies*. Our records show that it commonly bores in *Pinus* and *Pseudotsuga*.

Prionus californicus Motschulsky is often slightly over 60 mm. long and is next to the largest beetle attacking redwood. It is dark brown, with three large spines on the lateral margins of the pronotum. E. C. Van Dyke told the writer that it breeds in redwood stumps, and that he obtained adults and larvae from the bases of redwood telephone poles. Damage, to have been caused by the larvae of this beetle, has been observed in seasoned burls from Los Gatos. Linsley also recorded it from redwood, *Abies*, and *Pinus*. Additional hosts given in literature for this species are *Pseudotsuga* and hardwoods, such as *Quercus* and *Alnus*.

Semanotus ligneus sequoiae Van Dyke is a beetle about 9 to 12 mm. long, with the base of the wing covers of most specimens reddish and the rest of the body nearly black. The tips of the wing covers of some specimens are blackish with a large black spot at about the middle of each wing cover. This beetle works between the wood and the bark of recently felled or fire-scorched trees. It takes about a year for a complete generation. New adults have been taken early in the spring from wood cut about a year earlier. Pupation takes place in the outer sapwood. This subspecies is known only from redwood.

Callidium sempervirens Linsley is a shiny purplish-green beetle about 9 to 12 mm. long. It has been reared in the Big Basin area from limbs cut about a year and a half earlier. Linsley, who described this species (1942) also obtained his specimens from the Big Basin area, where he found them infesting limbs. This beetle is only known to attack redwood.

Callidium pallidum Van Dyke is similar in shape and somewhat larger than the above-mentioned species. The males are brown and the females green. Specimens in the California Academy of Science have been reared from redwood stumps in San Mateo and Santa Cruz Counties. They were taken in December, January, and March. The species is only known to attack redwood.

Anoplodera impura (LeConte) is about 8 mm. long and has brown wing covers and a darker brown head and thorax. Van Dyke says he believes he has taken it from redwood stumps. Although it is called the redwood borer, there seems to be no authenticated record of its feeding in this host. In literature it is recorded as feeding normally in *Libocedrus*.

Anoplodera mathewsii (LeConte) has a reddish-brown head and pronotum, and yellowish-brown wing covers, each with a large

black spot at the tip. It is about 15 mm. long. Larvae, pupae, and new adults have been collected in the sapwood in May and June from fairly well-rotted old stumps. It is also reported in literature as feeding in *Thuja*.

Anoplodera crassipes (LeConte) is about 10 mm. long. The body is blackish, but the pronotum is covered with short golden hairs and the wing covers are brownish with three (male) or four (female) black bars extending across them. It is recorded by Doane *et al.* (1936) as feeding in redwood, *Pinus*, *Umbellularia*, and *Eucalyptus*.

Leptura obliterata Haldeman is a yellowish-brown beetle about 16 mm. long. The typical subspecies has been taken from redwood stumps and logs. Nothing is known about its life cycle in redwood; other known hosts for the species are *Pseudotsuga* and *Abies*, and in literature *Tsuga*, *Picea*, and *Pinus*.

Atimia dorsalis LeConte is a yellowish-brown beetle with the sides of the body lighter in color. It is about 10 mm. long. Van Dyke reported in conversation having reared it from redwood limbs. Linsley also has a record of it from this host and from *Thuja* and *Juniperus*. However, according to Linsley, the redwood records may possibly involve *A. maritima* Linsley. *A. dorsalis* likewise feeds in *Cupressus* and *Libocedrus*.

Phymatodes decussatus (LeConte) is recorded by Hopkins (1903) as having been reared from a small dead tree. Probably the species was wrongly identified, as it normally feeds in oak. The record probably refers to the following species which is superficially similar.

Phymatodes nitidus LeConte is a shiny blackish-brown beetle about 7 mm. long. It has been reared from the limbs of this host and there is one record, from the California State Department of Agriculture, of larvae believed to have been this species feeding in the cones. Our records show that it also feeds in the giant sequoia, and in *Cryptomeria*, *Cupressus*, *Libocedrus*, *Thuja*, and possibly *Abies*. In the literature it is also recorded from *Juniperus*.

Dicentrus bluethneri LeConte is the smallest cerambycid attacking the redwood. It is about 6 mm. long and is black with a wide interrupted reddish-brown band across the wing covers, which are also tipped with reddish brown. New adults have been taken near Willits in October in pupal cells in dry broken limbs, which had

apparently been broken off the preceding winter. It is also common in *Pseudotsuga*, and Linsley has a record of it from *Abies*.

OTHER BORERS

Anthaxia aeneogaster Castlenau & Gory is a flattened bluish-black beetle about 6 mm. long. Van Dyke reported it as breeding in the sapwood of this tree. A larva belonging to this genus was taken from a limb infested with the cerambycid *Dicentrus bluethneri*. It also attacks the giant sequoia, *Cupressus*, *Libocedrus*, *Pinus*, *Pseudotsuga*, and various hardwoods.

**Serropalpus barbatus* (Schall) has been collected only in the larval stage, boring in the sapwood of a recently killed tree at Navarro. The larva is whitish, cylindrical, and about 20 mm. long. The adult is entirely brown and about 15 mm. long. Our records show that it also feeds in *Libocedrus* and *Abies*.

**Ctenicera* sp. near *rotundicollis* (Say) occurs commonly in the larval stage in the bark of trees about 10 inches d.b.h. near Willits. The larva confines its work to the inner bark, sometimes almost scoring the phloem. The specimens collected were about 8 mm. long with dark brown bodies and lighter brown heads. The urogomphi are bidentate with the inner tooth considerably smaller than the outer. Similar larvae were also collected near Klamath, California, under the bark of this tree.

Dromaeolus nitens Horn. Adults of this species have not been reared from this host, but the larval skins of what is believed to be this species are commonly taken from large galleries in the bark of living trees. In a green tree near Willits as many as 31 emergence holes have been observed in an area of about 10 square feet. Other similar larvae have been taken from cells in the bark. Larvae, which were apparently the same species, have been taken from the bark of the giant sequoia and from the sapwood of *Libocedrus*.

Ceruchus striatus LeConte is slightly flattened jet-black beetle with large jaws and strongly striate wing covers. The jaws of the male each bear a large upright tooth at about the middle of the inner upper margin; those of the female bear two smaller horizontal teeth on the inner upper margin. The beetles are about 13 mm. long. Doane *et al.* (1936) record it as living in the sapwood of dead trees. Linsley also has records of it in dead redwood limbs. In the literature it is recorded from fir, probably *Pseudotsuga*.

SCALE INSECTS

The following scale insects and mealybugs are known to attack

redwood, whether growing under natural conditions or as ornamentals. As practically nothing is known about their biology or distribution in redwood, they are merely listed here.

<i>Insect</i>	<i>Authority for redwood as host</i>	<i>Other hosts given in literature¹</i>
Armored scales definitely from redwood:		
<i>Cryptaspidotus shastae</i> (Coleman)	Essig (1926)	<i>Cupressus, Juniperus.</i>
<i>Aspidiotus hederae</i> (Vallot) ²	Coleman (1903)	<i>Umbellularia, Pinus, Taxus, and many more.</i>
<i>Lindingaspis rossi</i> (Maskell) ²	<i>ibid.</i>	<i>Araucaria and many others.</i>
Armored scales possibly from redwood:		
<i>Aonidiella aurantii</i> (Maskell)	Calif. State Dept. of Agric. 1942	<i>Citrus and many other deciduous hosts.</i>
<i>Hemiberlesia lantanae</i> (Signoret)	<i>ibid.</i>	<i>Abies</i> (Coleman 1903).
<i>Carulaspis visci</i> (Schränk) ²	<i>ibid.</i>	<i>Libocedrus, Pinus, Juniperus, Viscum Cupressus, Thuja.</i>
<i>Phenacaspis pinifoliae</i> (Fitch)	<i>ibid.</i>	<i>Pinus, Pseudotsuga, Tumion, Abies, Picea</i>
<i>Diaspis carueli</i> (Targioni) ²	<i>ibid.</i>	<i>Thuja, Libocedrus, Cupressus, Juniperus.</i>
<i>Lepidosaphes newsteadi</i> (Sulc) ²	<i>ibid.</i>	<i>Pinus.</i>
<i>Saissetia nigra</i> (Nietner) ²	<i>ibid.</i>	<i>Many tropical and sub-tropical plants, Pinus.</i>
Mealybugs:		
<i>Pseudococcus sequoiae</i> (Coleman)	Coleman (1903)	<i>Cupressus.</i>
<i>Pseudococcus ryani</i> (Coquillett)	Essig (1926)	<i>Cupressus, Libocedrus, Thuja, Pinus, Araucaria.</i>
<i>Puto cupressi</i> (Coleman)	<i>ibid.</i>	<i>Pinus, Cupressus, Tumion.</i>
<i>Pseudococcus citri</i> (Risso)	<i>ibid.</i>	<i>Wide variety of non-coniferous species.</i>

¹Most of the hosts have been obtained from Essig (1926) and Ferris (1937).

²Probably introduced.

TERMITES

Zootermopsis angusticollis (Hagan). Linsley has records of what appeared to be this species attacking redwood in contact with the ground near Los Gatos and Santa Cruz. Specimens that are either this species or *Z. nevadensis* (Hagen) have been taken from the sapwood of a scorched living tree near Navarro. These two species are so nearly similar that it is necessary to have soldiers to make a positive identification.

Reticulitermes hesperus Banks has been observed in the San Francisco Bay area, attacking redwood boards that have been in place in the soil less than five months.

Reticulitermes tibialis Banks. Linsley states that he has examined specimens from the bark of a living ornamental tree to which its activities were apparently entirely confined.

Kaloterms minor Hagen has been taken by Professor Fritz in the dead tops of green trees that had just been felled. Adults have also been taken in October at Navarro, where they had just begun to bore into the injured sapwood of a green tree. In addition, Linsley has records of this termite working in redwood rafters in a house at Santa Cruz, in redwood in a residence at San Simeon, and in the sapwood of dead branches at Big Sur.

APHIDS

Amphorophoro morrisoni (Swain) is a green aphid which E. O. Essig states, in correspondence, has been taken several times from redwood. He says it "appears on it late in the fall where the sexual forms are developed and eggs are laid on the suckers. This insect also feeds on Monterey cypress and related plants."

LEAF-FEEDING BEETLES

Dichelonyx valida (Le Conte) is recorded by Essig (1926) as feeding on the leaves of this host. It is a greenish-black scarab about 16 mm. long. The adults are said to appear in April and May.

MOTHS

**Laspyresia* sp. A heavy infestation of small ivory-colored caterpillars was observed in July and August in the bark of a large living ornamental tree in the East Bay area, but no adults have been obtained. A pupa was observed on August 20. The caterpillars force out borings from their galleries in the shape of little pellets, which are webbed together. They feed both in the dry

bark and in the outer phloem, where the injury causes beads of amber-colored pitch to form.

HORNTAILS

Sirex areolatus (Cresson). The females are metallic blue-black and about 32 mm. long. The males are smaller with the middle five segments of the abdomen brownish-red. The larvae are white, legless, and bear a short, sharp spine at the middle of the last body segment. The female is occasionally observed laying eggs in freshly cut and in fire-scorched trees. The work of the larva is confined to the sapwood, where it makes extensive galleries circular in cross section. Adults have been collected during August in Mendocino County. In literature it is listed as feeding also in *Cupressus*, *Pseudotsuga*, *Thuja*, and *Pinus*.

CARPENTER BEES

Xylocopa orpifex Smith is a metallic black bee about 18 mm. long. The hairs on the head and thorax of the male are buff; those of the female, black. The bees bore large holes in sound lumber, where they store the pollen on which the bee larvae feed. They are found in flight most commonly in October, November, and December. The species also breeds in the giant sequoia and in *Juniperus*.

GIANT SEQUOIA INSECTS

BARK BEETLES

Phloeosinus rubicundulus Swain, a reddish, barrel-shaped beetle about 3 mm. long, is the most common insect attacking giant sequoia. It is known to breed only in this host, very commonly attacking freshly broken limbs and tops. Attacks occur chiefly in March, April, and May, with a few throughout the summer. Often limbs lying on the snow are heavily attacked. Attacks average about one per 4 square inches. The galleries are constructed between the wood and the bark along the grain of the wood. They average about $1\frac{3}{4}$ inches in length. Of 20 galleries measured, the shortest was $\frac{3}{4}$ inch and the longest $3\frac{3}{20}$ inches. Each female lays about 35 eggs per gallery. The largest number counted was 75; the smallest number 16. Development is rather rapid. Pupae and new adults are found as early as July in limbs attacked early in the spring, and these two stages can still be found as late as October. It is not known whether the beetles that transform to new adults in the middle of the summer emerge immediately or winter over in the limbs and emerge with the main emergence of

the following spring. The beetles are of no economic importance. There is no record of their attacking even weakened or injured standing trees.

Lasconotus vegrandis Horn, also found in the galleries of *Phloeosinus rubicundulus*, is discussed more fully under coast redwood insects.

Nemozoma fissiceps (Fall) is a common beetle in the galleries of *Phloeosinus rubicundulus*, on which it probably preys. It is a very slender, shiny beetle about 5 mm. long. Two hornlike processes are present on the front of the head. The head and posterior half of the wing covers are nearly black; the pronotum and base of the wing covers are yellowish brown. It also occurs in the galleries of other species of *Phloeosinus* in the Sierra region.

AMBROSIA BEETLES

Gnathotrichus sulcatus (LeConte) is a dark brown, cylindrical, elongated beetle about 3 mm. long, which breeds abundantly in the sapwood. It attacks the trunk of recently felled and wind-fallen trees throughout the summer. Beetles have been taken from fresh attacks as late as October in a tree blown over by a windstorm early in September in Sequoia National Park. A dead adult has been taken from a wound it had made in a healthy standing tree, but there are no records of this species ever becoming established in a living tree. The adult constructs extensive galleries in the sapwood and excavates small "cradles" at the side of its galleries. An egg is laid in each "cradle" and upon hatching the larvae feed on the fungus growth that develops along the walls of the cradles. The fungus is introduced into the tree by the adult beetle. It also attacks redwood and several other genera of conifers listed under that tree.

FLATHEADED AND OTHER BORERS

Trachykele opulenta Fall is a beautiful golden-green beetle about 12 mm. long, which attacks both young suppressed trees and the wounds of large fire-scorched trees. In its early stages the larvae work in the bark, and between the wood and the bark, but they later mine the sapwood and heartwood. According to one field record they can develop entirely in the thick bark. When fire-scorched trees are attacked the mines are chiefly in the dead sapwood and in the outer wood along the edges of the "cat-face" where the bark is healing over. Mines also occur and emergence takes place in the dead wood of the "cat-face." Records indicate that it

takes at least three years for the beetle to complete its life cycle. Pupation occurs in August, September, and October, and transformation to the new adult stage takes place within a few weeks. The new adults overwinter in their pupal cells and emerge the following spring. *Libocedrus* is also attacked, and in the literature *Thuja* is given as another host.

Anthaxia aeneogaster Castlenau & Gory is a flattened, dark blue beetle about 6 mm. long which has been reared from small, recently broken limbs infested with *Callidium sequoiarum*. Emergence in the laboratory occurred during the spring, summer, and late winter from limbs broken the previous winter. The mines are constructed between the wood and the bark and in the sapwood, where pupation occurs.

Dromaeolus sp. Larvae which apparently belong to this genus have been collected from the thick bark of large standing green trees in Sequoia National Park. This species is further discussed under the heading Coast Redwood Insects.

ROUNDHEADED BORERS

Callidium sequoiarum Fisher is a blackish-blue beetle about 8 mm. long which bores between the wood and the bark and in the sapwood of freshly broken limbs. It has been reared during the spring from branches less than 1 inch in diameter, collected the previous winter. It probably has a 1-year life cycle. It constructs extensive galleries, reducing the sapwood to a powder that falls out through breaks in the bark, thus leaving a shell of bark around a core of inner sapwood. Giant sequoia is the only host known to be attacked by this insect.

Phymatodes nitidus LeConte is discussed under coast redwood insects. Larvae were taken at Palo Alto from the trunk of a small tree that had been dead about a year, and a single adult was reared in June from cones collected the previous November in Sequoia National Park.

Semanotus ligneus amplus Casey is a black beetle about 8 to 15 mm. in length, with the basal third of the wing covers reddish and with antennae about half as long as the body. The larvae commonly work between the bark and wood of recently felled or fire-scorched juniper, cedar, and cypress, but specimens taken from giant sequoia in the Mariposa Grove and now in the U. S. National Museum have been checked by Linsley.

LEAF FEEDERS

**Halisidota argentata* Packard is a yellowish moth with reddish forewings marked with silvery spots. It has a wing expanse of about 2 inches. The caterpillars of this moth have been observed to attack and develop to maturity on a tree 25 feet tall in Yosemite National Park. The caterpillars overwintered as small larvae on the twigs and began to feed early in spring. Considerable damage was done to the tree by these caterpillars as early as the middle of March. Pupation occurred in the last three weeks of June. The first moths emerged July 3 and moths continued to emerge until July 17. Damage is caused by the caterpillars chewing off the adnate needles. Many of the twigs were chewed nearly through, causing them to break and hang down. This infestation was controlled by handpicking the larvae. *H. argentata* usually feeds on *Pinus*, *Abies*, and *Pseudotsuga*.

Argyresthia sp. has been identified by H. H. Keifer, of the California State Department of Agriculture, from foliage of giant sequoia, on which it was apparently feeding.

Cutworms. Damage to trees in nurseries by caterpillars believed to belong to this group of insects is mentioned by Fry and White (1931). The caterpillars are reported to sever the stems just below ground level.

Diaspis carueli Targ. has been identified by Keifer from foliage of giant sequoia.

Aonidiella aurantii (Mackell) has been identified by Keifer from foliage of this tree.

Cryptaspidiotus shastae (Coleman). Infestations of this grayish scale insect have been observed on small trees in Sequoia and Yosemite National Parks, especially along dusty roads. In none of the infestations examined was the damage serious enough to affect the growth of the trees appreciably. Nothing is known about the biology of this insect on giant sequoia. In literature it is listed as attacking the coast redwood and *Juniperus*.

Hemiberlesia rapax (Comstock) was reported by Coleman (1903) as breeding abundantly on giant sequoia in the Stanford Arboretum. It has a wide variety of hosts.

**Carulaspis visci* (Schrank) was observed in February on the leaves of giant sequoia growing as an ornamental at Stanford University. It had a wide variety of hosts.

TERMITES

Zootermopsis nevadensis (Hagen) has been taken from the sapwood of suppressed sequoia trees infested and apparently recently killed by *Trachykele*.

CARPENTER BEES AND ANTS

Xylocopa californica Cresson and *X. orpifex* Smith were found to have had a large colony in the dead top of a green tree 12 feet in diameter when it fell in Sequoia National Park several years ago. *X. californica* resembles *X. orpifex*, but is larger and its body has a greenish metallic sheen. The habits of the two species are similar. They bore holes in sound dead wood, where they store pollen on which the bee larvae feed.

Camponotus sp. This ant was taken from the heartwood at the base of the tree mentioned in the preceding paragraph. A fire scar extended nearly around the base of this tree, and the ants were working in the fire-scorched wood. Observations indicated that it was the activity of this insect, coupled with rot, which undermined the support of the tree, causing it to fall. Members of this genus are also very common in old giant sequoia stumps.

The specific names of the two insects listed below indicate that they feed on either of the sequoias, but later records do not bear this out.

Vespamima sequoiae (Hy. Edwards) is listed in the original description as if it fed in *Sequoia sempervirens*, but the writer has been able to find no authenticated later record that it attacks this host. Records obtained thus far indicate that it breeds only in *Pinus* and *Pseudotsuga*. The late G. P. Engelhardt, who revised this family, wrote me that he had no record of this moth working in sequoia.

Sphinx sequoiae Boisduval was described in 1868 from "a single individual found resting on the trunk of a tree in the forests where the gigantic conifers called *Sequoia* grow," hence its name, but so far as is known, no one has ever found it attacking or feeding on *Sequoia*.

SUMMARY

Fifty-two insect species are listed from coast redwood and twenty species from giant sequoia. Nine of these species are common to both hosts, but all nine of them have additional hosts. Four species feed, so far as is known, only on *Sequoia*, three of them

being confined to redwood and the other feeding only on giant sequoia. No insect has yet been found that feeds only on both sequoias.

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COLLECTING BRACHYCISTIDINE FEMALES

(Hymenoptera: Tiphiiidae)

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This spring (1952) a collecting party of the California Insect Survey, Division of Entomology & Parasitology, University of California, composed of P. D. Hurd, Jr., G. A. Marsh, P. H. Timberlake and myself, made a considerable effort to collect nocturnal mutillids and tiphiiids on the California deserts. The results of this effort were gratifying for six brachycistidine females and numerous mutillid females were taken, as well as a great many males of these two groups.

The first female brachycistidine was taken at Hopkins Well, Riverside County, crawling out of the sand on a sand dune sparsely covered with vegetation. Two additional females were collected about one mile north of Plaster City, Imperial County. Both of these insects were found on fine sand in an area covered with the typical desert flora. The other three females were collected in a sand dune region a short distance east of Borego, San Diego County. Two of them were taken on the leeward side of a road,

possibly blown there by the strong wind, which was prevailing at the time of our collecting.

The only generalities that can be made are that all the female brachycistidines were found on fine, unconsolidated sand at night. Whether or not these insects are partial to sandy country is uncertain, however, for we looked primarily only where there was fine sand, the small insects being more readily seen there than on coarser sand and gravel, where they could more easily hide in the shadows. On the other hand, evidence supporting their preference for a sandy situation is given by Mickel and Krombein (1942:652), who cite the capture of a female in the sand dune area of San Francisco, California, and by Hurd and Rozen, who, subsequent to the spring trip, collected two specimens in the sand dunes of Antioch, California.

The method of collecting both the tephritid and mutillid female was a simple one. Each member of the party, using a Coleman lantern, walked about the sandy region and picked up the females by hand. The smaller females, especially those of the genus *Chyphotes*, were readily captured by moistening a finger and lightly applying it to the dorsal surface of the insect. None of the brachycistidine females were taken coming to light, if for no other reason than because we were continuously moving about. However, it is certain that at least some of them are attracted to light, for in addition to the information provided by Mickel and Krombein (*ibid.*) H. E. Evans and P. D. Hurd on their Mexican trip of 1951 secured several specimens which came to a stationary Coleman lantern. Furthermore, one of the Antioch specimens was found at the base of a Coleman lantern which had been resting on the sand for a considerable length of time.

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RANGE EXTENSION OF *PHOLISORA LIBYA* SCUDDER (LEPID., HESPERIIDAE): On August 13, 1951, a single slightly-worn female was taken about 13 miles northwest of Coalinga, Calif., on Highway 33, as it flew along a dry wash by the roadside. This is, as far as I can ascertain, the first record for this typically mohavian species from the west side of the San Joaquin Valley.—J. W. TILDEN.

NEW WESTERN EPHEMEROPTERA, III

VELMA KNOX MAYO

Nickel Plate, British Columbia

(Plate III, figures 9, 11)

***Ameletus monta* Mayo, new species**

Male imago in alcohol. Head brown; ocelli white, bordered by dark brown at bases. Pronotum dark brown with fine tracheations laterally. No creamy areas on postero-lateral edges of pronotum as in *A. celeroides* McDunnough. Mesonotum dark brown with creamy white in unsclerotized area between prescutum, and scutum; also creamy spot on either side of midline near scutellum. Pleural sclerites dark brown; unsclerotized areas at bases of wings creamy white. Sternites brown. Forelegs pale yellowish-brown; middle and hind legs creamy. Wings with a reddish-brown tinge due to prominence of reddish-brown longitudinal veins, cross veins less distinct; stigmatic area milky. Abdomen semi-hyaline; first tergite dark brown, tergites 2-7 semi-hyaline, washed with pale tracheations; laterally tergites 2-7 very pale; 8-10 dark brown with pale streak on edges. Sternites paler than tergites; 2-8 with blackish ganglionic markings; anterior border and lateral edges of sternite 9 brown. Genitalia as in figure 11. Forceps and forceps base very pale yellowish brown. Penes are narrow, parallel, and slightly incurved at tips; at the base of each are three prominent spines. Tails white, with minute brown hairs. Each segment delicately bordered posteriorly with reddish brown.

Male, pinned. Thorax dark brown. Forelegs dark brown; middle and hind legs yellowish. Wings brown tinged; longitudinal veins prominent; cross veins less so, but not indistinct. Abdomen much as in alcoholic specimen, but the posterior borders show as darker bands of brown; segments 8-10 dark brown; tergites with dark tracheations; sternites paler than tergites with ganglionic areas blackish. Genitalia and tails brown. Length body, 10 mm; wing 10 mm.

Female in alcohol. More uniformly colored than male. Thorax light reddish-brown with same creamy areas at wing bases. Forelegs yellowish-brown, middle and hind legs pale yellow tinged with red on tarsi. Wings tinged with brown. Abdomen not semi-hyaline as in male. Tergites about same shade as thoracic notum, posterior borders darker, all tergites with fine tracheations. Sternites paler than tergites but not hyaline as in male. Ganglionic areas blackish. Subanal plate very small, covering less than half the eighth segment. Tails white, speckled with short brown hairs as in male.

Nymph. Head and thorax brown; median line of thoracic notum pale. Legs yellowish-brown with last tarsal segment dark reddish-brown. Abdominal tergites brown with dark submedian streaks from anterior margins; area between these streaks pale on segments 3 and 4; laterally dark streak extending from posterior margin near medial side of gill attachment nearly to antero-lateral corner of tergite. Tracheae of gills are numerous and readily seen under microscope, but cannot be seen with naked eye. Sclerotized band present on gills as far from margin as width of band (fig. 9). Ventrally, ganglionic markings distinct on sternites 2-8; sternite 1 pale; 2-4 and 8

uniformly brown; 5-7 pale except around ganglionic markings; 9 pale; each sternite with brown patches on either side of midline; small distinct white patches in antero-lateral corners. Tails fringed; pale basally, banded with dark brown medially and pale distally.

Holotype, male imago (in alcohol) MCGUIGAN CREEK, PAINE MOUNTAIN near NEW DENVER, BRITISH COLUMBIA, altitude 6,500 ft., August 29, 1940. *Allotype*, female imago same data. *Paratypes*, one vial, same data. One male imago, paratype, and one nymph in collection of California Academy of Sciences. Rest of material in collection of writer.

Ameletus monta new species is related to *A. celeroides* McDunnough. The distinguishing character is mainly in the genitalia. *A. monta* has three large spines on each penis whereas in *A. celeroides* there are but two small spines on each penis. *A. monta* is larger in body form.

EPHEMERELLA FLAVILINEA McDunnough

Dr. McDunnough loaned me specimens of *Ephemerella flavilinea* McDunnough and I was thereby able to determine that the species occurred very commonly in the Jackson, California region in May, 1938. The nymphs were reared and both male and female imagos obtained. The imagos varied in color, some darker, others paler. It was found that the specimens taken from Jackson Creek were slightly smaller than those from Dry Creek in the same region.

Ephemerella delantala Mayo, new species

(Plate I, figure 2)

Nymph. (fig. 2). A member of the *E. simplex* group. Yellowish species with brown markings. Head yellowish on vertex; mouthparts brown. Maxillary palp present. Pronotum yellow, with faint traces of adult pattern showing through, more distinctly in male. Mesonotum yellow, with dark brown pattern as in fig. 2, giving a banded appearance across anterior third of mesonotum. Pleural and sternal sclerites brown. Forelegs yellowish; middle and hind coxae dark brown; trochanter and basal half of femora brown; tibiae and tarsi yellowish, amber colored near claws. Six or seven minute denticles on claws. Abdominal tergites 1-3 dark brown in both sexes; in the male the 4th tergite is brown laterally and yellow medially; in female, 4th tergite is more uniformly brown (fig. 2). In both sexes tergites 5-7 are wholly yellow, tergite 8 dark brown along posterior border and lateral angles, yellow anteriorly, tergite 9 wholly brown, tergite 10 yellow. The dorsal abdominal spines give the appearance of folds on either side of midline forming a pleat on tergites 4-8. The spines on tergites 4-8 are conspicuous and increase in size to rearward; they bear fine spicules. On tergites 2, 3, and 9 projections relative to spines on posterior margins are scarcely visible. Prominent postero-lateral spines present on segments 5-8 (fig. 2); these are curved up dorsally forming a trough between the lateral and dorsal spines in which lie the gills. Gills

present on segments 4-7 only; those on 4 semi-operculate. Ventrally, abdominal sternites 1-4 brown; 5-7 and anterior part of 8, yellow tinged with brown on either side of midline; lateral angles and posterior portion of 8 and anterior half of 9 dark brown. Tails yellowish with light fringe of hairs on distal half. Length: body of male nymph 5 mm; female nymph 6 mm.

Holotype, nymph (in alcohol) MARTIS CREEK near TRUCKEE, PLACER COUNTY, CALIFORNIA, altitude 6,000 ft., June 23, 1933. Collected by Dr. P. R. Needham and party. *Paratype*, one nymph, same data. Holotype in collection of the California Academy of Sciences. Paratype in collection of writer.

Ephemerella delantala new species is related to *E. margarita* Needham. It is a member of the *E. simplex* group and readily distinguishable from *E. attenuata* McDunnough and *E. simplex* McDunnough. The former has tubercles present on the head and thorax; in *delantala* there are no tubercles on head and thorax. *E. simplex* has no dorsal abdominal spines and no denticles on claws, both of which are present on *delantala*. *E. margarita*, to which *E. delantala* is most closely related, is larger; the legs are pale, tibiae and tarsi banded; in *E. delantala* the trochanter and basal half of the femora are dark brown; tibiae and tarsi not banded. Lateral extensions of abdominal segments 5-8 are well developed on *E. delantala*, present on segments 4 to 9 in *E. margarita*. "Rather short dorsal spines present on tergites 3-9" in *E. margarita*, prominent dorsal spines present on segments 4-8 of *E. delantala*. Abdomen broadest at segment 7 in *E. margarita*; broadest at segment 5 in *E. delantala*. Tails not banded in *E. delantala* as in *E. margarita*.

Baetis palisadi Mayo, new species

(Plate II, figures 3, 5. Plate III, figure 6)

Male imago (fig. 5). Head brown. Turbinate eyes fairly large; orange. Pronotum with dark brown lateral triangles; median area smoky; posterior margin widely banded with creamy. Mesonotum rich dark brown with creamy areas on either side of parapsidal grooves extending to tip of scutellum; laterally, brown. Metanotum and first abdominal tergite dark brown. Pleural sclerites deep brown, unsclerotized areas creamy. Wings hyaline; venation colorless, stigmatic area milky; cross veins in stigmatic area very indistinct, some appear to be anastomosed. Hind wing with well developed costal projection, three veins and no intercalaries; the third vein is well developed, extending to beyond the middle of hind margin (fig. 3). Legs pale, colorless; coxae pale with brown sutures; femora pale with faint tinge of brown near tibial joining, likewise tibia with pale brown tinge at tarsal joining; claws dissimilar, brown. Abdominal tergites 2-6 hyaline, tergite 2 with two pale smoky spots on anterior margin, but these are lacking on

remainder of tergites; tergites 7-10 yellowish-brown. Tails colorless. Laterally the tergites are faintly tinged with smoky around stigmatic area. Sternites 2-6 hyaline, sternite 1 yellowish, sternites 7-9 deeper yellow. Forceps pale yellowish; genitalia as in fig. 6. Length of body 8 mm; wing, 8 mm.

Female imago. In the female the coloring is more uniformly light brown. The brown thorax is much lighter than that of male. Wings hyaline, venation distinct, light brown. Legs yellowish with sutures outlined in brown; all femora with brown streak the entire length of anterior and posterior surfaces; tarsal joinings brown, claws brown. Abdomen not hyaline, but a yellowish brown; each tergite is marked near the anterior margin with two pair of small dark patches, one above the other on either side of midline; laterally near pleural fold each tergite has two brown markings. Sternites are pale yellow, marked as tergites with two brown streaks on either side of mid-ventral line near the anterior margin; sternite 9 shaded with brown. Tails pale. Length: body 8 mm; wing 8 mm.

Holotype, male imago (in alcohol), BIG PINE CREEK, SIERRA NEVADA MOUNTAINS, INYO COUNTY, CALIFORNIA, altitude 8,100 ft., July 5, 1939. Collected by the writer. *Allotype*, female imago, same data as male. *Paratypes*, three male imagos; one female imago, same data. Holotype in the collection of the California Academy of Sciences. Paratype, one female in same collection. Others in collection of the writer.

In type of genitalia *Baetis palisadi* new species is allied to *B. piscatoris* Traver and *B. adonis* Traver, from California, and *B. lasallei* Banks of Wisconsin. *B. palisadi* is considerably larger than any of these. It can readily be distinguished from *B. piscatoris* by the abdominal tergites which are not banded; from *B. lasallei* it can be separated by the absence of intercalaries in the hind wing; also by the absence of black dots on each tergite, in the male. The maculation of the entire body differs from that of *B. adonis*. In the hind wing the third vein is well developed in *B. palisadi*, in *adonis* it is short, ending in the basal third of hind margin.

***Ephemerella sierra* Mayo, new species**

(Plate I, figure 1, and Plate III, figures 7, 8)

Nymph (Plate I, fig. 1). Color of mature nymph dark brown with a distinct reddish tinge on abdomen and ventral surface. Immature nymphs light brown. Head with a pair of prominent, erect occipital tubercles; vertex light brown between tubercles. On the pronotum is a twin pair of long, pointed tubercles which are subequal, the posterior in some cases being slightly shorter; medially, next to posterior tubercles is a pair of shorter tubercles, plainly visible; on same level as anterior twin tubercle is a smaller sharp, lateral tubercle; between the twin tubercles the pronotum is light brown; laterally, dark brown. The tubercles are covered with small, heavy spines. There are three pairs of tubercles on the mesonotum; the first is near

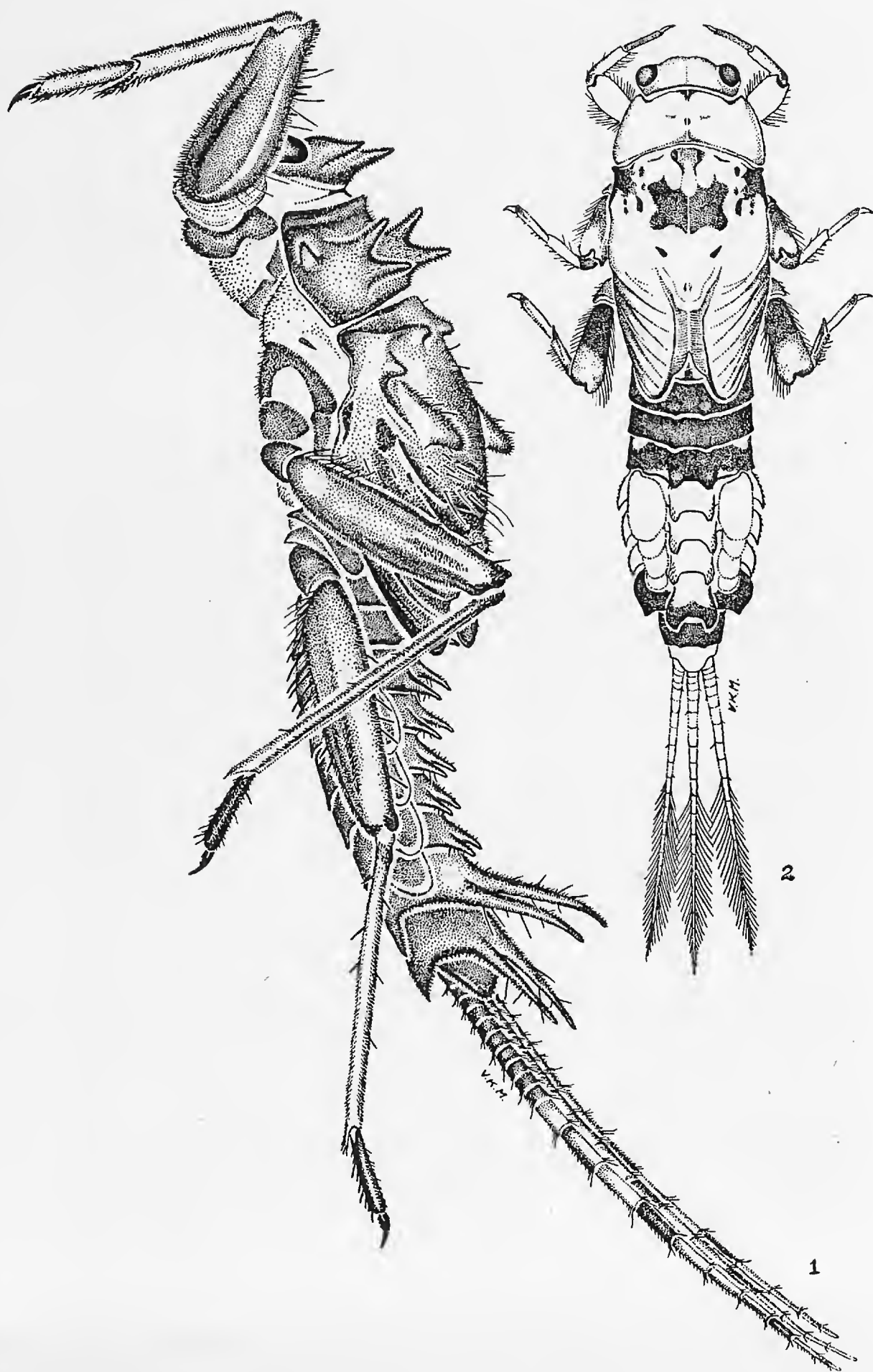


Plate I: Fig. 1 *Ephemera sierra*, n. sp., nymph. Fig. 2. *Ephemera delantala*, n. sp., nymph.

the anterior margin, one tubercle on either side of midline; a ridge extends from each short, blunt tubercle to the antero-lateral angle of mesonotum. Laterally and slightly posterior to the anterior tubercles is the second pair of longer ones in the middle portion of segment is a third pair, very much larger, wide basally and directed backwards. The area between the large tubercles and the scutellum is light brown; the rest of scutum is dark reddish brown; all tubercles and the area between them along midline are covered with short, heavy, black spines. On the posterior portion of mesonotum are numerous long hairs. There is a slight hump between wing pads which corresponds to the scutellum of the adult. Legs light, washed with darker brown; traces of a dark streak on each femur, fore femur with no teeth on anterior margin. Tibial thumb fairly sharp. Hind tibia as long as trochanter and femur combined. Prosternum with a long, blunt tubercle directed towards head. Mesosternum light reddish brown except for two distinct lunate, dark markings, one on either side of midline behind leg bases. Pleural sclerites dark brown; unsclerotized areas light. Abdominal tergites 2-9 each bears a pair of sharp tubercles on posterior margin; those on tergites 2-7 are approximately the same size and directed backwards, those on segments 5-6 are wider apart than the others. The tubercles on tergites 8-9 are very much longer, at least four times the length of those on segments 2-7 and bear numerous long, heavy bristles; the tubercles on tergite 8 are more erect than those on 9, which are directed backwards. Tergites 3-7 and 10 are deep reddish brown, very dark laterally, tergites 2 and 8-9 are light brown between tubercles and darker laterally. Gills on segments 3-7. Abdominal sternites reddish brown; laterally on each segment are two dark red markings on either side of midline; the medial of these is an oblique streak from anterior margin. There is a trace of a dark mid-ventral line on sternites 5-9; sternites 1-5 are lighter along midline. Lateral prolongations of abdominal segments as in fig. 8, pl. III. Tails dark brown in basal third, the outer two-thirds alternately light and dark, each segment ringed posteriorly with spines. Length: body 11-12 mm.

Holotype nymph, SOUTH FORK BISHOP CREEK, INYO COUNTY, CALIFORNIA, altitude 9,500 ft., August 28, 1938. *Paratype*: eight mature nymphs, same data. Two immature nymphs. American River, California, altitude 4,200 ft., July 24, 1938. Collected by the writer. Twenty immature nymphs collected by Dr. P. R. Needham and party as follows: Independence Creek, one mile above Independence, California, June 13, 1934. South Fork Bishop Creek, June 20, 1934, June 25, 1934. Megee Creek, Mono County, July 6, 1934. One paratype in collection of California Academy of Sciences.

One nymph collected July 4, 1938 South Fork Bishop Creek, Inyo County, California, altitude 9,500 ft., was removed to Mammoth Lakes, Mono County, California, altitude 8,000 ft., and reared to the subimago stage. The subimago emerged on August 28, 1938.

Following is a description of the specimen: Bright red species. Head reddish brown, yellow around bases of antennae. Ocelli white. Pronotum deep

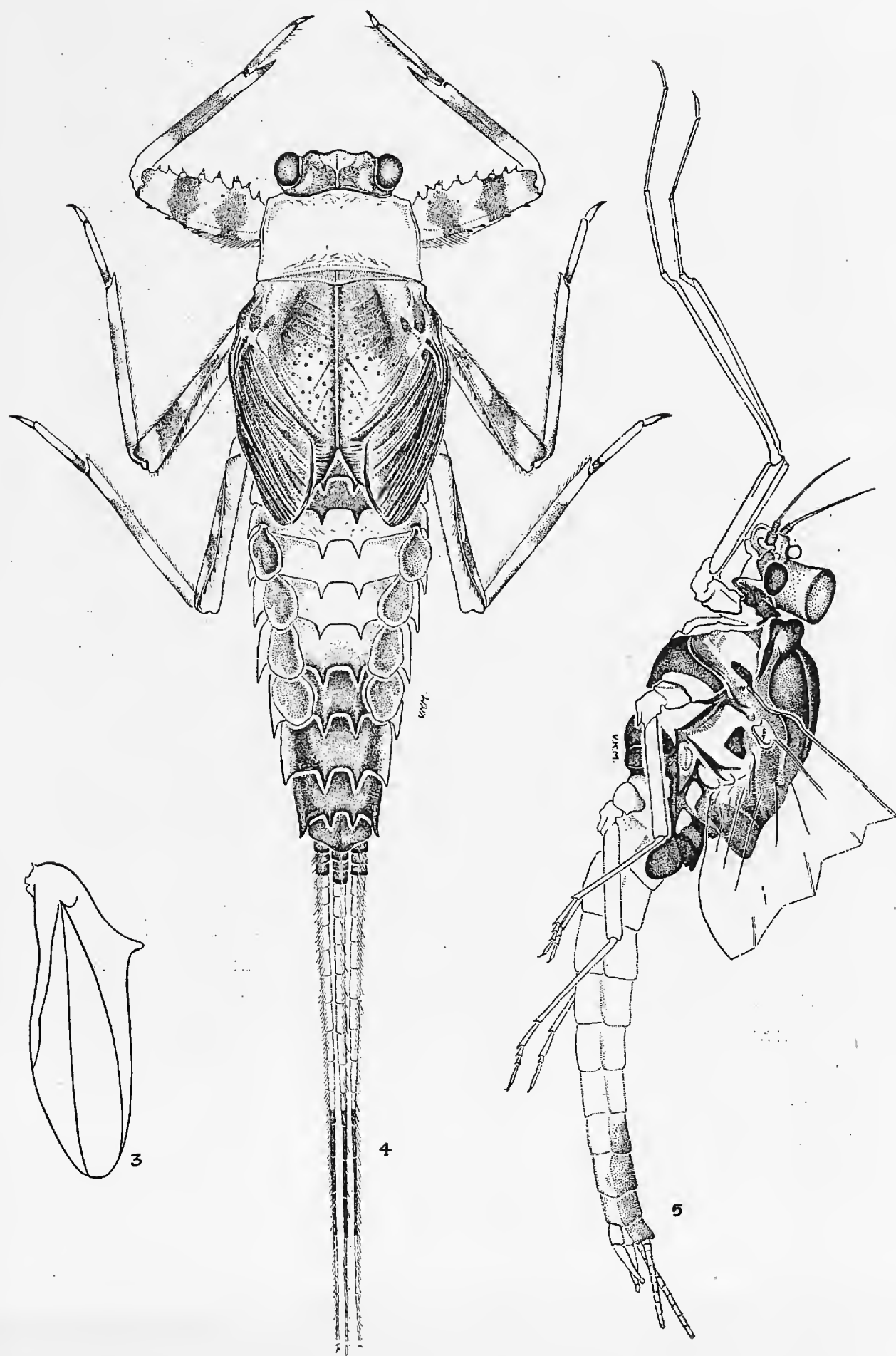


Plate II: Fig. 3. Hind wing *Baetis palisadi*, n. sp. Fig. 4. *Ephemerella wilsoni*, n. sp., nymph. Fig. 5. *Baetis palisadi*, n. sp., adult.

reddish brown laterally with a light red area in the medial portion. Mesoscutum lighter brown surrounded by bright red. Light area on either side of midline near scutellum. Pleural sclerites bright red tinged with rose; unsclerotized areas light and powdery white in part. Wing venation dark brown; adult subcostal vein shows through as bright red. Fore legs deep reddish brown, femora of middle and hind legs light yellow in basal half and bright red distally; tibiae yellowish and tarsi tinged with dark brown. All abdominal segments bright red; each tergite bordered posteriorly by yellowish white, the latero-posterior angles and pleural fold whitish. Ventrally all segments but the ninth are bordered posteriorly with yellowish white; each sternite with a dark lunate streak from anterior margin on either side of mid ventral line. Forceps base light reddish brown; forceps and penes dark reddish brown (see genitalia, fig. 7, pl. III). Tails blackish in basal half; brown apically. Length: body 11 mm; wing 14 mm; tails 10 mm.

Ephemerella sierra new species is a member of the *E. fuscata* group and allied to *E. autumnalis* McDunnough of British Columbia. Dr. McDunnough kindly loaned me specimens of *E. autumnalis* and I was able to determine that the nymphs which I reared from Wilson Creek near New Denver, British Columbia on August 10, 11, 12, 1940 at an altitude of 1,700 ft., were undoubtedly *E. autumnalis*. On the nymphs of *E. sierra* and *E. autumnalis* the tubercles are similar; the twin tubercles on the pronotum are subequal; this is the main difference between these species and *E. spinifera* Needham. The tubercles on abdominal segment 8 in *E. sierra* are erect and those on segment 8 of *E. autumnalis* are "bent backward and downward." The body of *E. sierra* is stouter than that of *E. autumnalis*.

I also reared an *Ephemerella* species closely related to *E. sierra*, from Shephard Creek, Brexton, British Columbia, altitude 3,500 ft., on July 1, 1940. I failed to rear the male imago, but obtained two female imagos. Judging from the marked difference in general appearance of the nymphs and also from the variation in dates of emergence, this Brexton species is certainly not *E. autumnalis* and further study on more material will be necessary to determine its relationship to *E. sierra*.

Ephemerella wilsoni Mayo, new species

(Plate II, figure 4 and Plate III, figure 10)

Male imago, pinned specimen (fig. 10). Blackish-brown. Head black, Thoracic notum blackish; unsclerotized areas on pleuron pale reddish-brown. Fore legs dark brown; middle and hind legs paler, with tibiae and tarsi yellowish. Wings hyaline; longitudinal veins dark brown; cross veins indistinct; finger-like prolongations of wing membrane extending well beyond tip of scutellum. Abdomen reddish-brown, pleural fold and posterior borders of

segments pale. Forceps light brown, penes blackish. Tails black basally, pale brown distally.

Female imago unknown.

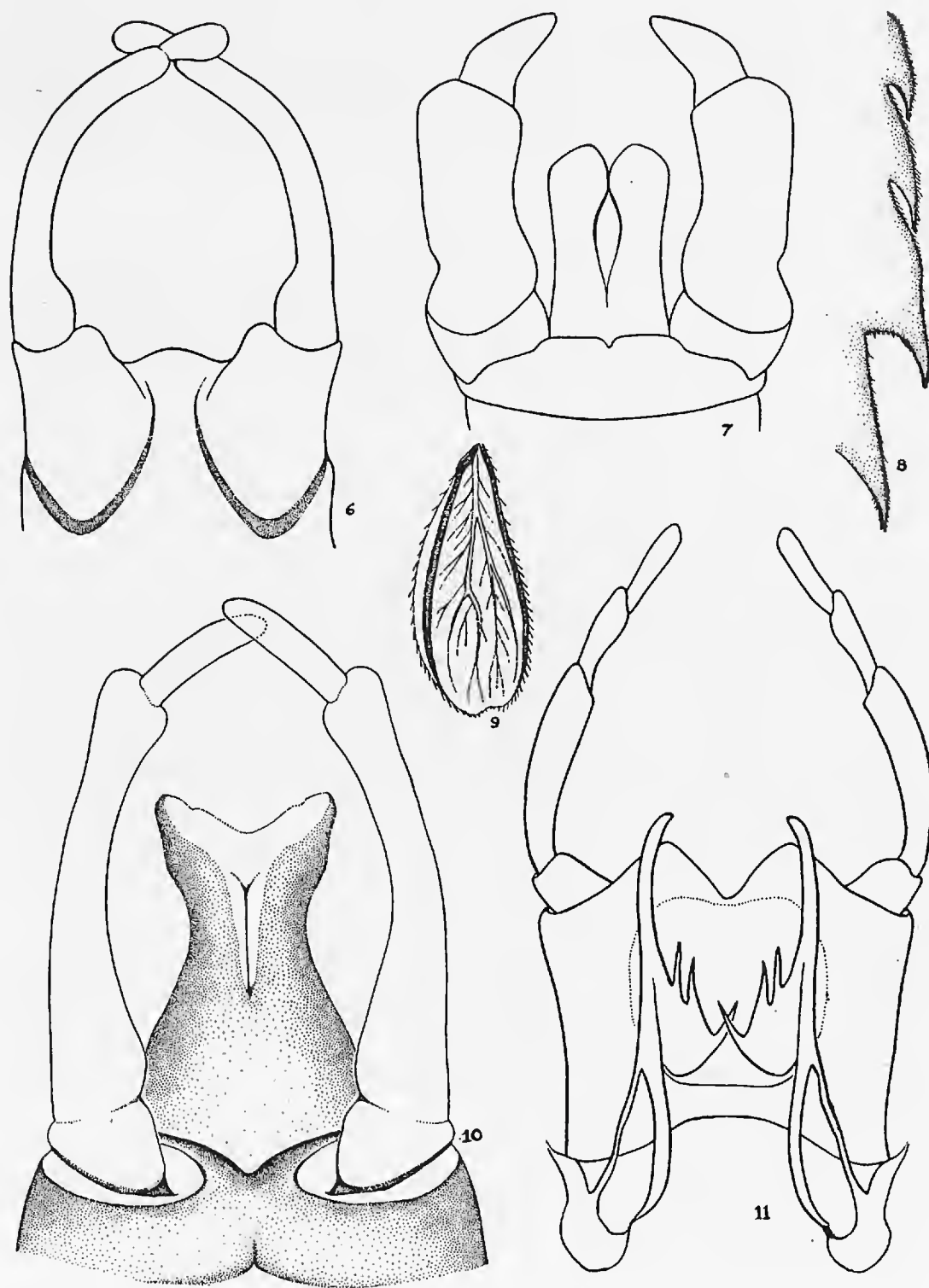


Plate III: Fig. 6. Male genitalia *Baetis palisadi*, n. sp. Fig. 7. Male genitalia subimago, *Ephemerella sierra*, n. sp. Fig. 8. Lateral prolongations of abdominal segments of nymph, *Ephemerella sierra*, n. sp. Fig. 9. Gill of nymph of *Ameletus monta*, n. sp. Fig. 10. Male genitalia of *Ephemerella wilsoni*, n. sp. Fig. 11. Male genitalia of *Ameletus monta*, n. sp.

Male imago in alcohol. Thorax blackish-brown; abdomen a light reddish-brown. Pronotum smoky with black tracheations; blackish on either side of midline; postero-lateral corners white. Mesonotum blackish-brown; distinct white strip between prescutum and scutum; prescutum black; white patch near prescutum on either side of scutum proper. Medially the entire scutum darker than the sides which have a reddish tinge; yellow patch laterally on postscutum light red patches medially and laterally on scutellum. That part of wing membrane attached to the scutellum is developed into a finger-like process extending well beyond the tip of scutellum. Pleuron of prothorax is white with delicate tracheations. On mesopleuron the sclerites are blackish-brown, and unsclerotized areas white with faint tracheations. The entire prosternum is white, unsclerotized with the exception of the basisternal sclerite, a small blackish brown area between fore coxae. Mesosternum blackish with white along midline. Fore legs dark brown; coxae and trochanters brown with black tracheations; femora, tibiae and tarsi blackish. Middle and hind legs pale yellowish with delicate black tracheations on coxae and trochanters; femora with margins pale yellow, centers smoky with dark tracheations, brownish tinge in outer third; tibiae pale with very delicate tracheations in basal portion, tarsi and claws tinged with brown on dorsal surface. Wings hyaline; longitudinal veins blackish; cross veins pale, indistinct; stigmatic area milky. Abdomen much lighter than thorax. Tergites with reddish brown markings on a yellow background, and dense network of tracheations; along the mid-dorsal line is a hyaline streak bordered on either side by reddish streaks which attain the anterior margins; these are prominent on segments 2-4. Tergites 1-2 smoky with dense tracheations; at anterior border on tergite 2 are wide, narrow hyaline patches on either side of mid-dorsal streak; on tergite 3 they are larger and on 4-7 they extend from the mid dorsal line to the lateral edge of tergite so that the reddish markings on these segments do not attain the anterior border, except at midline. The posterior borders of tergites 1-2 are dark smoky with dense tracheations; those of tergite 3 less so with irregular blackish spots; 4-8 yellowish and 9 reddish brown. Laterally each tergite is yellow; the stigmatic areas are marked with light patches surrounded by deep reddish-brown; these dark brown lateral patches are prominent on all tergites. Reddish brown coloring of segments 8-10 darker than that of other segments. The posterior borders of sternites 1-8 are distinctly yellow as is also the midline. Laterally each sternite with a prominent dark reddish brown area; these are marked with two oblique pale streaks extending from the anterior margin of each sternite and also in the central portion of each segment (except 9) near midline, are two small pale dots outlined with reddish brown. The antero-lateral angles of each sternite pale brown; ganglionic patches dark smoky on sternites 1 and 2, 4 and 5. Sternites with fewer tracheations than tergites. Tails black basally, reddish medially with distal half white. Genitalia (see fig. 10) reddish-brown. Forceps not swollen apically. Last segments of forceps white; first and second segments reddish brown. Length body 14 mm; wing 15 mm.

Nymph, male (fig. 4.) Alcoholic specimen dark brown with white pronotum. Living specimen black distinguished by prominent white pronotum. Head black, mottled with brown. Roughened area on vertex indicating very

slight occipital tubercles. No frontal horns or frontal shelf. Pronotum entirely white with faint tracheations. Mesonotum blackish with creamy patches on either side of midline near scutellum. Anterior border of scutum also creamy; heavy tracheations on scutum. Thoracic sternites pale with prominent dark ganglionic areas. Legs pale, banded with black. Coxae with well developed spinous ridge along anterior suture. Fore femora with heavy spines along anterior margin. Tibial thumb long, sharp. Abdominal tergites 1-9 with paired short spines. Tergites 3-6 white except under gills; spines on these segments also white; other tergites blackish with pale lateral margins; tergites 9 and 10 wholly dark, tergite 10 with long hairs from medial part anterior margin. Gills present on segments 3-7. Abdominal sternites light brown except 8 and 9 which are black; ganglionic markings on 1-7. Tails white except close to base where each is ringed with black, and beyond middle where a fifth of length is black. Length body 9 mm; tails 7 mm.

Holotype, male imago, pinned; WILSON CREEK, near NEW DENVER, BRITISH COLUMBIA, September 3, 1940, altitude 1,700 ft. *Paratypes*, two male imagos pinned, September 4 and 7, 1940, same locality. One male imago in alcohol, August 28, 1940, same data. One paratype, male imago pinned, and one nymph and cast skin in collection of California Academy of Sciences.

Ephemerella wilsoni new species is similar to *E. coloradensis* Dodds. Dr. McDunnough loaned specimens of *E. coloradensis*, both nymphs and adults, and the two species are readily distinguishable. The adults of *E. wilsoni* are much blacker than those of *E. coloradensis*. There is no distinct color contrast in nymph of *E. coloradensis* as in *E. wilsoni*. Occipital tubercles more prominent in *E. coloradensis*, and the tibial thumb is blunter than in *E. wilsoni* (see fig. 4). Also the abdominal spines are smaller than those of *E. wilsoni* and covered with spicules which are not present on the spines of *E. wilsoni*.

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NOTES ON THE ECOLOGY OF *CULISETA MACCRACKENAE*
IN SAN BERNARDINO AND RIVERSIDE COUNTIES,
CALIFORNIA

(Diptera: Culicidae)

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For the past year, data have been obtained on the breeding habits of *Culiseta maccrackenae* Dyar and Knab. There is some question as to previous collections having been made from San Bernardino County. Several specimens collected by the authors have been deposited with the Bureau of Vector Control, Berkeley.

Collection records from Urbita Springs, near San Bernardino, California:

Fourth instars, pupae and adults, March 8, 1951.

Four instars, March 15, 1951.

Adults (numerous); May 13, 1951. Collected in clumps of tall dead grass in willow brush.

Habitat: *Culiseta maccrackenae* were quite abundant at Urbita Springs during March, 1951. After careful inspection of breeding conditions, the area was dusted by mosquito control personnel. Larvae and pupae on March 8, 1951 were numerous in a borrow pit 10 ft. in diameter and located in a grove of deciduous trees not in leaf. The water was 11 - 44 cm. deep, partially shaded, and contained considerable decaying debris in the form of tree leaves, twigs, and grass. Most of the surface was covered by *Lemna*, duckweed. The pH was 7.2 and the temperature ranged from 12° C. at 9:00 a.m. to 15° C. at 2:20 p.m. on February 22, 1951.

Adult mosquitoes were resting on the 2 - 3 ft. high moss-covered banks of this pool and under overhanging grass. Many were also collected in tall dead grass, weeds and brush in the immediate vicinity of the breeding area. *Culiseta maccrackenae* females were also taken from inside the lodges of *Neotoma fuscipes* on February 22, and November 29, 1951 in San Timoteo Canyon, Riverside County.

At Urbita Springs, several females attempted to bite at which time they were collected alive in shell vials and returned to the laboratory. In the laboratory at 3:45 p.m. on March 8 one female completely engorged with blood on the author's arm. On March

21, seven adult females from the March 8 collection were given the opportunity to feed on a human subject, one fed to complete engorgement and two took partial blood meals. The latter two had consumed considerable sugar water before the opportunity to feed on blood was presented to them. April 1, at midnight, one female fed readily on a human host and obtained almost a complete blood meal. Bites of this species were painful for one-half hour following the bite and large welts appeared at each feeding point. Welts were visible as long as two days following the initial feedings. The above data indicate that this species will feed on a human host, but certainly man is not one of its preferred hosts.

Culiseta maccrackenae were observed copulating readily in the daytime under laboratory conditions. A male 12 hours of age copulated with a female $2\frac{1}{2}$ days old, in a plastic cylinder 20" x 6.5". No blood meal had been obtained by the female. This pair remained in copulation from 9:45 a.m. until 2:45 p.m. Other pairs remained in copulation for at least two hours.

Males and females approach face to face prior to copulation. After copula is effected, they face in opposite direction. The male has frequently been seen in a vertical position suspended head down, supported only by the genitalia in copula.

In San Bernardino and Riverside counties, *Culiseta maccrackenae* breeds in very limited numbers, except for certain isolated pools which may in the winter and spring seasons contain moderate numbers of larvae and pupae. This is in agreement with reports on their breeding in central and northern California.

ADDITIONAL COLLECTIONS OF MOSQUITOES FROM WOOD RATS' NESTS

(Diptera: Culicidae)

RAYMOND E. RYCKMAN AND KEN Y. ARAKAWA

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Anopheles freeborni Aitken has been reported from the nests of *Neotoma fuscipes* Baird (Ryckman and Arakawa 1951).

Four additional species of mosquitoes have been collected from woodrats' nests in California and Mexico. The authors have found mosquitoes in the nests of *Neotoma* from Mt. Diablo, April 2, 1949 to Baja California, Mexico, August 7, 1951.

Species collected from nests of *Neotoma fuscipes* Baird:

Anopheles freeborni Aitken, San Timoteo Canyon, Riverside Co., Calif. Nov. 29, 1951, 4 ♀. Dec. 12, 1951, 1 ♀.

Culiseta inornata (Williston) San Timoteo Canyon, Riverside Co., Dec. 12, 1951, 4 ♀.

Culiseta maccrackenae Dyar and Knab, San Timoteo Canyon, Riverside Co., Calif. Feb. 22 and Nov. 29, 1951, one ♀ each collection.

Culex stigmatosoma Dyar, five miles south Tijuana, Baja California, Mexico. August 7, 1951, 1 ♀.

Culex tarsalis Coquillett San Timoteo Canyon, Riverside, Co., Calif., Nov. 29, 1951, 4 ♀. Dec. 12, 1951, 11 ♀.

The above data are concerned only with the actual specimens returned to the laboratory and do not take into consideration those which frequently escaped.

In the San Timoteo Canyon a careful search has been conducted to find other resting places, but wood rats' nests were the only habitat in which the mosquitoes were found. Those taken during the winter on cold days were apparently taking refuge from the cold inclement weather; however, the collection in Mexico was on a very hot day during the dry season. In the latter situation, *Culex stigmatosoma* was apparently seeking shelter from a dry, hot environment.

The food and dung chamber in which most of the mosquitoes are found affords protection from adverse climatic conditions. It is the opinion of the authors that this recently investigated mosquito habitat is a preferred ecological niche for mosquitoes in certain environmental situations as the San Timoteo Canyon studies have indicated. When surveys of overwintering adult mosquitoes are conducted, the nests of *Neotoma* should be inspected.

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Pan-Pacific Ent. 27:172.

A NEW AGONUM FROM OREGON

(Coleoptera: Carabidae)

BORYS MALKIN AND MELVILLE H. HATCH

*University of Washington, Seattle***Agonum (Anchomenus) sargentorum** Malkin & Hatch, new species

Rufous impunctate the elytra except at the extreme margins bright shining viridescent and finely transversely microstrigose.

Head: rufous, moderately elongate, eyes very strongly projecting at sides. *Antennae*: rufous, about half as long as body, second segment barely twice as long as wide, third segment the longest slightly longer than fourth which is longer than fifth (the proportions of segments 3, 4, 5, being respectively 11:10:9); apical segment conical. *Thorax*: dark rufous, clouded on disc, diaphanously paler at sides, slightly wider than long, (proportions of length to width 4.3:5.2), apex about seven-eighths as wide at base, sides broadly reflexed, arcuate in front, feebly sinuate before the obtuse hind angles, basal fovae deep, impunctate. *Elytra*: metallic, viridescent except for yellow side margins; sides parallel, gradually narrowing in posterior third, at extreme apex truncate and produced into a spine at the sutural angles. Elytral intervals smooth, impunctate, flat, striae finely incised, third interval with three punctures; elytral length is to the width in proportion of 15.2:8.5. *Ventral surface*: yellow-rufous, smooth, and impunctate. Legs dark yellow with apices of tibiae and femora darker. Male with a single seta on each side of last abdominal sternite. *Length* 11.9 mm.

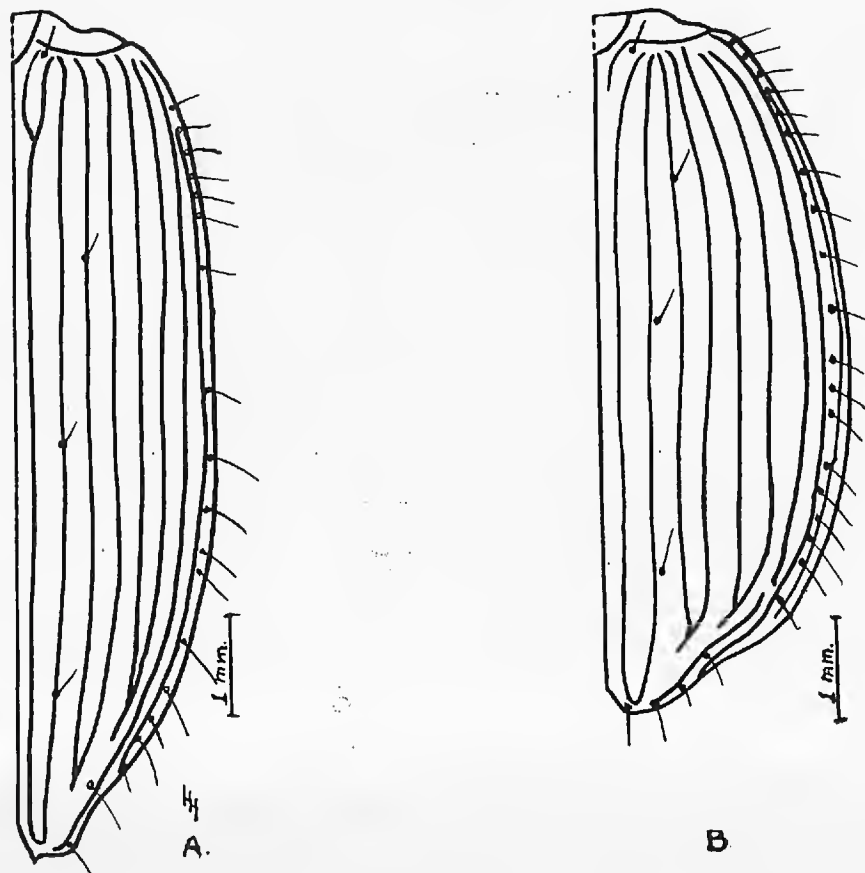


Fig. 1. Elytron of A) *Agonum sargentorum*, and B) *A. ovipenne*.

Holotype: unique male, EUGENE, OREGON. 23.VI.1941 B. Malkin collector under pile of dried cow manure, in Hatch's collection at the University of Washington.

This species runs to *Anchomenus* in Casey's¹ key in which group it traces to *ovipenne* Mannerheim. From this species as well as from the other species of the group it may be readily distinguished by the metallic, viridescent coloration of the elytra and rufous coloration of the body. The elytra are likewise narrower than in *ovipenne* and parallel at the sides; the intervals are more flat instead of being convex as in the Mannerheim species; and the tip of the elytra is produced, a character absent in *ovipenne*. It is possible that the rufous coloration is due to immaturity.

We have named this striking species after Mr. and Mrs. Samuel Sargent of Portland, Oregon, whose enthusiasm for beetle collecting has contributed numerous specimens to our respective collections. The drawings of the elytra (fig. 1) were executed by Helen Gellermann Houk.

¹Casey, T.L., "A Revisional Study of the American Platyninae" Memoirs. IX. 1920.

NOTES ON TWO SPECIES OF CALIFORNIA STEM BORERS

(Hymenoptera, Cephidae)

WOODROW W. MIDDLEKAUFF

University of California, Berkeley

In his monograph on the Cephidae Ries (1937)¹ was able to examine only five specimens of *Caenocephus aldrichi* Bradley. Recently two additional specimens have come to the author's attention. One specimen extends the range into California and the other verifies its occurrence in Washington. The only previous Washington record (holotype) is based on a poorly labeled specimen presumably from Washington Territory deduced from the abbreviation "W. T." The collecting data from the new specimens are as follows: California, Contra Costa County: *Orinda*, ♀, V-24-51 (G. Loshbaugh, Middlekauff collection, on *Conium maculatum* Linnaeus. Inasmuch as the host is unknown the notation that this

specimen was taken on poison hemlock may be significant. Washington, King County: *Seattle*, ♀, V-22-45 (H. J. Jensen, C. I. S.²).

Several specimens of the very rare *Janus rufiventris* (Cresson) have also been collected in Berkeley. Data are as follows: California, Alameda County: *Berkeley*, ♀, IV-23-48 (R. E. Beer, Middlekauff collection); ♀, III-27-51 (W. Middlekauff, C. I. S.). The latter specimen was collected on the foliage of coast live oak, *Quercus agrifolia* Neé, but considering that all of our other species of *Janus* bore in the pith of woody plants, this record is probably not significant.

¹Trans. Amer. Ent. Soc., 1937, 63:259-324. October.

²Collection of the California Insect Survey, Univ. of Calif., Berkeley.

BOOK NOTICE

THE APHID GENUS PERIPHYLLUS. By E. O. Essig and Frieda Abernathy. 166 pp., 43 figures. University of California Press, Berkeley and Los Angeles, California. Price \$3.00. 1952.

This book represents a comprehensive study of the aphid genus *Periphyllus*. It consists of eleven chapters. The first is devoted to a discussion of the genus and considers its origin, history and the many forms of individuals that are encountered. A system of symbols is given to designate the various distinct forms that are recognizable, which in the species *P. californiensis* (Shinji), totals 17. A number of the species have extremely complicated life histories and seasonal cycles. Of great interest are the peculiar dimorphic stages which are characteristic of several of the species. These young dimorphs of the fundatrigeniae appear in April and May. They are tiny, nearly microscopic, disc-like individuals which remain in the first instar without any appreciable growth throughout the long hot summer. In the fall they suddenly begin to grow, complete their development in a very short time, and give rise to parthenogenetic and apterous or alate sexual individuals. The complicated development indicates a very long association with their host.

The remaining ten chapters are devoted to a discussion of each of the known species. For each species an account is given of the published records, description, historical review, known life history, and seasonal trend, host range and other information such as that which pertains to distribution, and collection records.

Detailed life history and seasonal studies were conducted with the California maple aphid, *Periphyllus californiensis* (Shinji) and the European maple aphid, *P. testudinacea* (Fernie). It was these investigations that revealed the complexity of development and they well illustrate the need for a careful and thorough approach to similar biological problems.

The book is excellently illustrated and should be in the library of every aphidologist as well as ecologists and other entomologists who are interested in insect life histories and biology.—A. E. MICHELbacher.

INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE; PROPOSED AMPLIFICATION, CLARIFICATIONS AND EXTENSIONS TO BE CONSIDERED BY THE INTERNATIONAL CONGRESS OF ZOOLOGY, COPENHAGEN, 1953.

Zoologists and palaeontologists are reminded that at its meeting held in Paris in 1948 the Thirteenth International Congress of Zoology decided that a number of general problems of great importance involving the text of the International Code of Zoological Nomenclature should be brought forward for decision at the next (Fourteenth) International Congress of Zoology at its meeting to be held in Copenhagen in 1953. The Paris Congress further decided that, as a preliminary to the submission of these problems to the Copenhagen Congress, the Secretary to the International Commission on Zoological Nomenclature should confer with interested specialists and, having done so, should submit comprehensive Reports, with recommendations.

In pursuance of the duties so entrusted to me, I have prepared papers on each of the problems remitted to me for Report, in each of which I have set out the issues on which, as it appears to me, the Copenhagen Congress will need to take decisions. In these papers also I have submitted for consideration a number of suggestions based upon such preliminary consultations as it has already been possible to hold. The object of these papers is to elicit expressions of opinion on the issues involved from as wide a circle as possible of interested specialists.

The subjects dealt with in the papers referred to above are the following:

- (1) Emendation of zoological names: proposed substitution for Article 19 of simple clear-cut rules capable of being easily applied (Commission's reference Z.N.(S.)356) ;
- (2) Clarification and amplification of the rules relating to the naming of families and lower categories of suprageneric rank (Commission's reference Z.N.(S.)357) ;
- (3) Proposed introduction of rules for regulating the naming of Orders and higher taxonomic categories (Commission's reference Z.N.(S.)360) ;
- (4) Species to be accepted as the type species of a nominal genus, the name of which was published in a generic synonymy, if names so published are to be treated as possessing nomenclatorial availability (Z.N.(S.)387) ;
- (5) Application to be given to a trivial name which, when first published, was applied to a particular species or specimen but which is stated also to be a substitute name for some previously published name (Commission's reference Z.N.(S.)361) ;
- (6) Neotypes: question whether this class of type specimen should be officially recognized and, if so, under what conditions (Commission's reference Z.N.(S.)358) ;

- (7) The means to be devised for securing stability in zoological nomenclature (Commission's reference Z.N.(S.)359).

A special volume (vol. 7) of the *Bulletin of Zoological Nomenclature* has been allotted for the publication of the foregoing papers, which it must be understood constitute an important instalment of the Agenda on nomenclature questions of the Copenhagen Congress next year. Parts 1/2 containing the first instalment of the above papers will be published on 25th February 1952; the whole of the remainder of the volume will be published within the next six weeks.

The object of the present NOTICE is to draw the attention of zoologists and palaeontologists to the arrangements being made for the consideration of the foregoing problems by the Copenhagen Congress next year, and to express the hope that Nomenclature Committees of museums and other scientific institutions and also as many individual specialists as possible will furnish as soon as possible answers to the questions specifically asked in the concluding paragraph in each of the seven papers enumerated above regarding the action which, in their opinion or, in the case of Committees, in the opinion of their members, it is desirable that the Copenhagen Congress should take on each of the important problems involved. It is particularly hoped that there will be a wide and representative response to the present appeal, so that the proposals to be submitted to the Copenhagen Congress may be such as will command the widest possible measure of support among the general body of zoologists and palaeontologists, both those engaged on taxonomic work and also those engaged in the teaching of zoology and geology and those working in the various fields of applied biology.

Nomenclature Committees and individual specialists who respond to the present appeal for assistance and advice will render a double service if they will be so good as to assist the International Commission by observing the following procedure when furnishing statements of their views: (1) Where comments are furnished on two or more of the general problems enumerated above, the comments furnished on each of those problems should be on separate sheets of paper. (2) Every comment furnished should be clearly marked with the Commission's Reference Number as indicated in the list given above. (3) Comments should be typewritten, on one side of the paper only, with wide margins and should be furnished in duplicate.

In order that there may be sufficient time to prepare the Reports called for by the Paris Congress—and thus to make those Reports available well ahead of the Copenhagen Congress—it is particularly hoped that Nomenclature Committees and individual specialists responding to the present appeal be so good as to despatch their comments as promptly as possible. They should in any case reach me not later than 31st July 1952.

All communications relating to the foregoing matters should be addressed to myself, as Secretary to the International Commission on Zoological Nomenclature (28 Park Village East, Regent's Park, London, N.W.1, England).—FRANCIS HEMMING, Secretary to the International Commission on Zoological Nomenclature.

THE FALSE SPIDER MITE
GENUS PSEUDOLEPTUS BRUYANT

(Acarina: Phytoptipalpidae¹)

EDWARD W. BAKER² AND A. EARL PRITCHARD³

The genus *Pseudoleptus* Bruyant (1911) was proposed for a grass-feeding mite in Uruguay. The original description was inaccurate, and certain other mites that feed on monocotyledonous plants have been erroneously assigned to the genus.

Through the kindness of Mr. C. S. Carbonell of Montevideo, Uruguay, topotypes of *Pseudoleptus arechavaletae*, the type of the genus, have been obtained. It is the purpose of this paper to re-describe this species and to recharacterize the genus.

Genus PSEUDOLEPTUS Bruyant

Pseudoleptus Bruyant, 1911, Zool. Anz., 38: 340; Oudemans, 1928. Ent. Ber., 7: 287; Vitzthum, 1942, Klass. Ordn. Tierr. 5(Abt. 4, Buch 5): 812; Sayed 1942, Bull. Soc. Fouad 1er Ent., 26: 81; McGregor, 1949, Mem. S. Califor. Acad. Sci., 3(2): 1; Baker, 1949, Amer. Midl. Nat., 42: 353; Radford, 1950, Union Internatl. Sci. Biol. (Sér. C), 1: 80. Type—*Pseudoleptus arechavaletae* Bruyant; monotypic.

Trichadenus, Oudemans, 1938 (not Rondani, 1870), Tijds. Ent., 81: LXXV., Misidentification.

Oudemans (1928) included in *Pseudoleptus* certain species that properly belong to the genus *Dolichotetranychus* Sayed, and Vitzthum (1942) and Radford (1950) considered *Dolichotetranychus* to be a synonym of *Pseudoleptus*. Sayed (1942) showed that the two genera are distinct; however, the palpal and tarsal characters given for *Pseudoleptus* were inaccurate.

Oudemans (1938) considered *Pseudoleptus* to be a synonym of *Trichadenus* Rondani. The writers concur with Sayed (1942), however, that *Trichadenus* cannot be recognized with certainty on the basis of the original description alone. Moreover, the type of *Trichadenus* was found on mulberry, and *Pseudoleptus* is known only from salt grass.

Pseudoleptus resembles *Pentamerismus* McGregor, *Aegyptobia* Sayed, and *Phytoptipalpus* Trägårdh in that the palpus is five segmented, a condition that is not found in other phytoptipalpid

¹Considered by various authors as the Pseudoleptidae, Trichadenidae, or Tenuipalpidae. The genus Phytoptipalpus, however, was first used as the basis for a suprageneric name.

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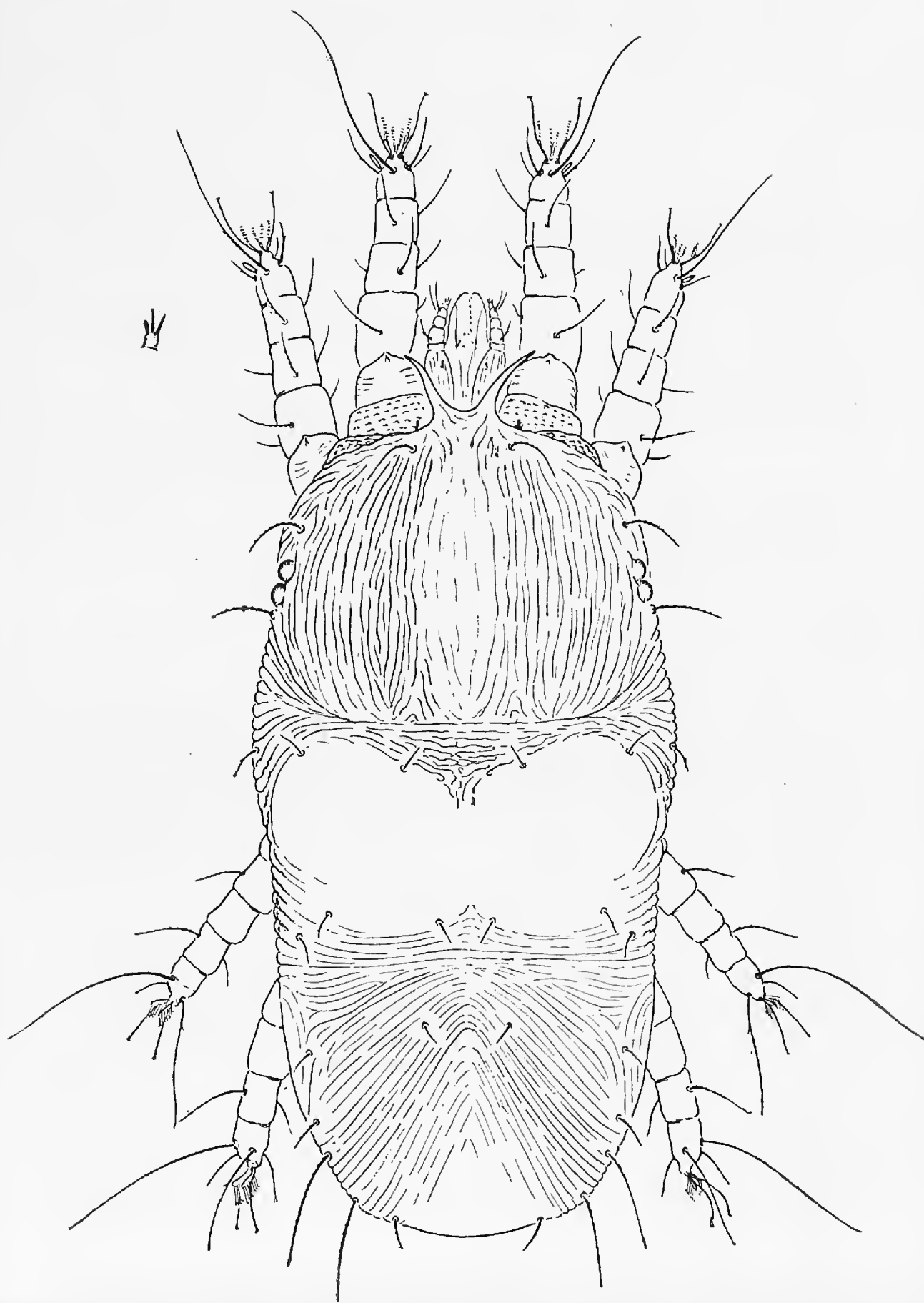


Fig. 1. *Pseudoleptus arechavaletae*, female, dorsal aspect.

genera. *Pseudoleptus* differs from *Pentamerismus* and *Aegyptobia* in that the female has the hysterosoma subdivided by transverse striae and lacks a ventral plate (a plate bearing the pair of setae located just anterior to the genital plate). It differs from *Phytotipalpus* principally in that the adult possesses four pairs of legs.

Palpus 5 segmented. Adult with 4 pairs of legs. Rostral shield present, narrow and bifurcate. Body of female elongate-elliptical, the metapodosoma and opisthosoma separated by transverse striae. Integument with fine striae. Propodosoma with 3 pairs of dorsal setae; metapodosoma with 2 transverse rows of 6 dorsal setae each; opisthosoma with a pair of mid-dorsal setae anteriorly and with 5 dorsolateral setae on either side. Female with genital plate present; ventral and anal plates absent; with 3 pairs of anal setae. Male with 4 pairs of genito-anal setae.

The genus *Pseudoleptus* contains a single species.

PSEUDOLEPTUS ARECHAVALETAE BRUYANT

(Figs. 1-3)

Pseudoleptus arechavaletae Bruyant, 1911, Zool. Anz., 38: 340. Cotypes: larvae, nymphs, males, and females, Uruguay, on *Distichlis scoparia*; possibly at the University of Lille, France.

Tenuipalpus haumani Lahille, 1927, Rev. Univ. Buenos Aires (ser. 2), 24: 1295. Cotypes: females, Argentina, on *Distichlis spicata*; possibly at the University of Buenos Aires. New synonymy.

Female.—Rostrum reaching to end of femur I. Palpus with two setae and a sensory peg on distal segment. Legs I and II with the femora, genua, and tibiae each with the dorsal seta slender and somewhat longer than width of segment; tarsi I and II each with a sensory peg, posterodistally; tarsi III and IV without sensory pegs; claw with hook absent. Rostral shield strongly bifurcate, the lobes narrow and divergent and reaching the distal end of trochanter I. Propodosoma dorsally with longitudinal, solid striations; dorsal propodosomals setiform and minutely serrate, the anterior pair about one-half as long as distance between them. Metapodosoma dorsally nearly smooth except for transverse striae of strictures anteriorly and posteriorly; dorsal metapodosomals similar to dorsal propodosomals but smaller. Opisthosoma dorsally with caudolaterally diverging, solid striae; dorsolateral opisthosomals five in number, the third and fourth considerably longer than the first, second, and fifth. Podosoma ventrally with solid, longitudinal striae in intercoxal areas, with transverse, dotted striae in wide median area; anterior and posterior pairs of medioventral metapodosomals very short. Opisthosoma ventrally with transverse, dotted striae anteriorly and with semilongitudinal, solid striae laterally and posteriorly; genital plate smooth, with 2 pairs of setae. Length of body 290 μ , including rostrum 343 μ ; greatest width of body 166 μ .

Male.—Tarsi I and II each with a single sensory peg as in female. Rostral shield reaching to middle of trochanter I. Propodosoma dorsally similar to female. Metapodosoma dorsally with semilongitudinal, solid striae; opisthosoma dorsally with transverse striae anteriorly and semi-longitudinal, solid striae behind dorsocentrals. Podosoma ventrally similar to female.

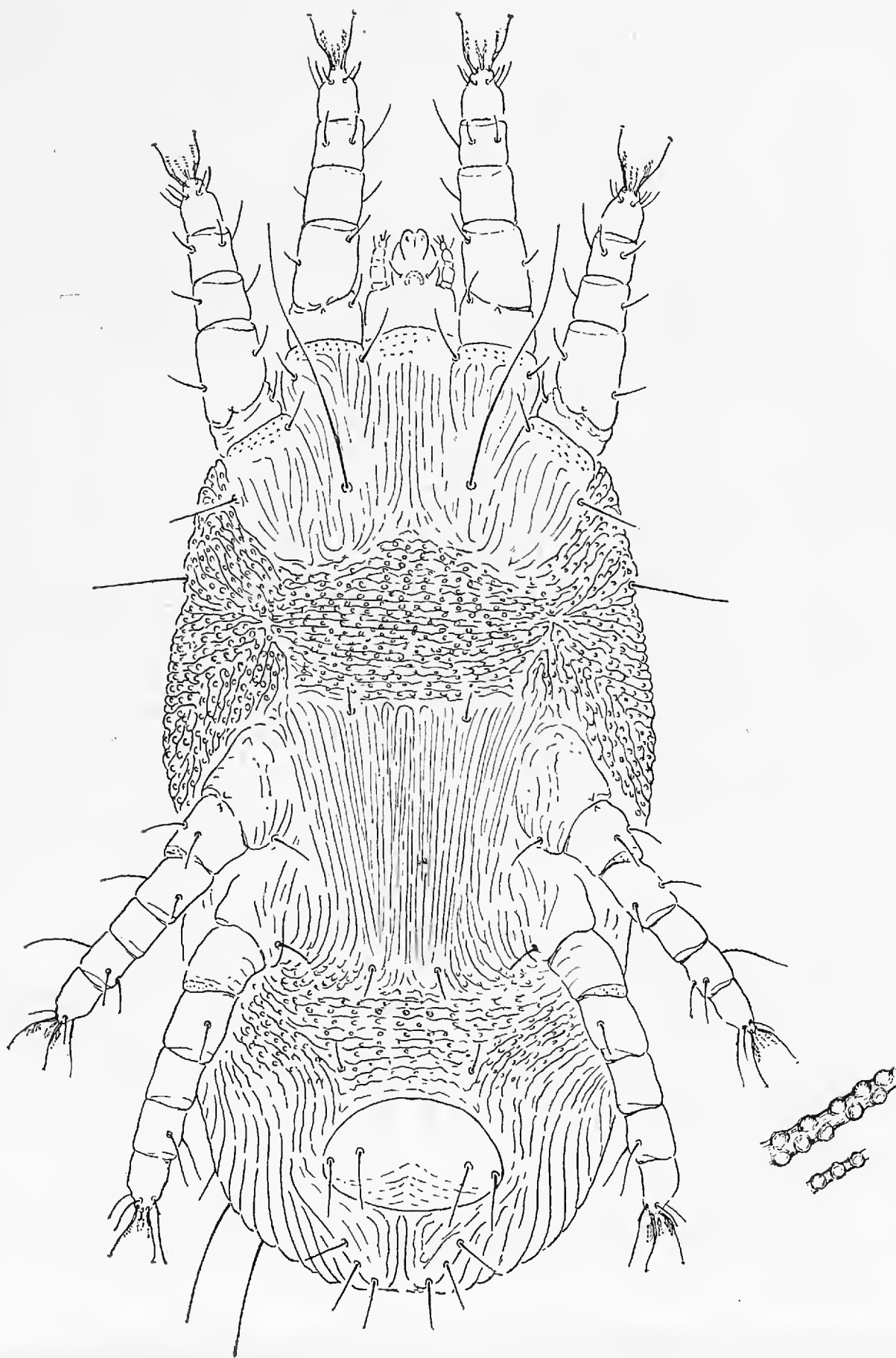


Fig. 2. *Pseudoleptus arechavaletae*, female, ventral aspect.

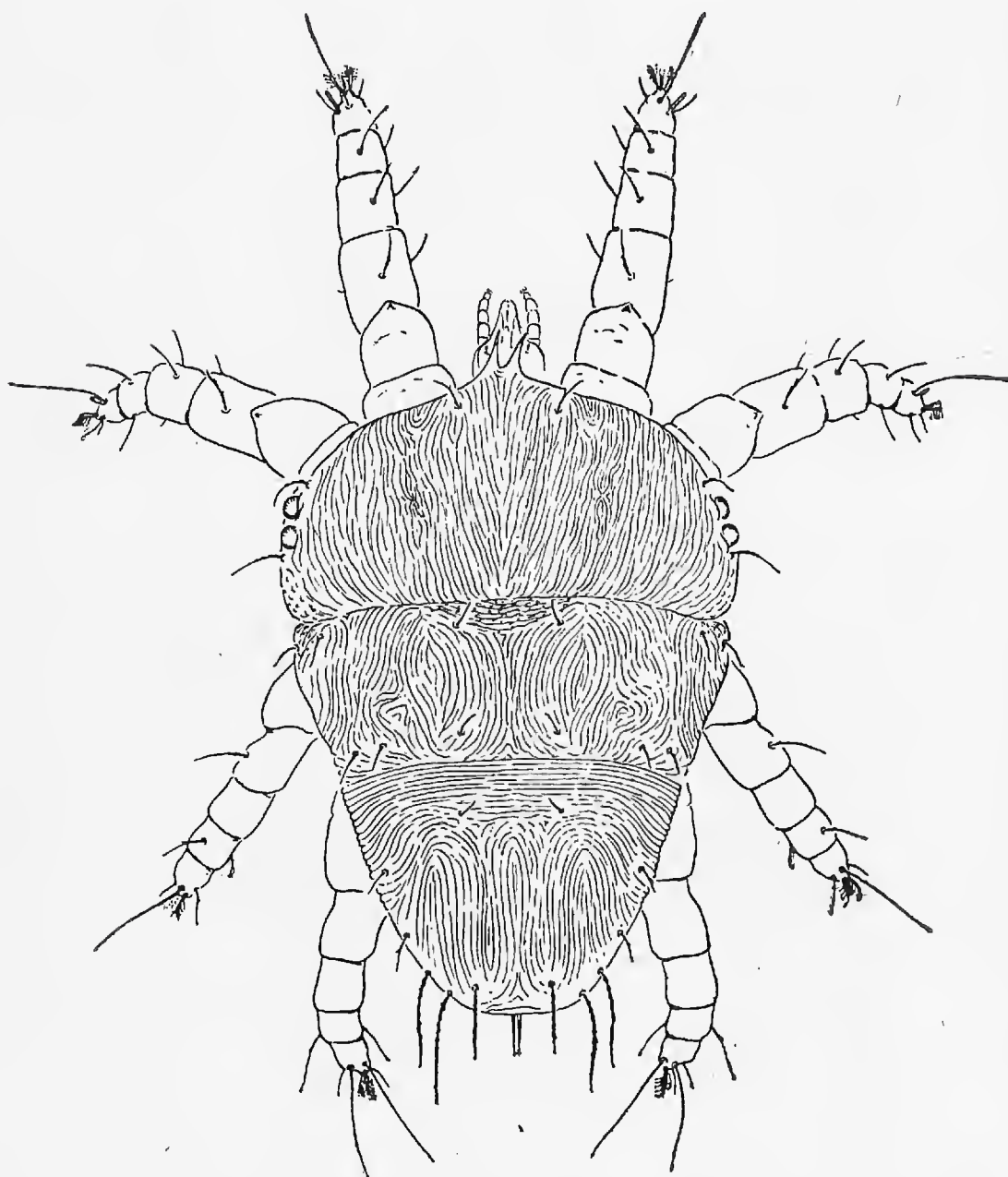


Fig. 3. *Pseudoleptus arechavaletae*, male, dorsal aspect.

Opisthosoma ventrally with transverse, dotted striae; medioventrals located near middle. Length of body 223 μ , including rostrum 266 μ , greatest width of body 133 μ .

Specimens examined are from Canelon Chico, Canelones, Uruguay, April 4, 1910 (from C. S. Carbonell), on *Distichlis scoparia*.

The figures of *Tenuipalpus haumani* that were presented with the original description clearly indicate that this species belongs to the genus *Pseudoleptus*. *Haumani* was described without reference to *arechavaletae*, and no characters were given to separate the two species. The similarity of the geographic location and hosts indicates that they are synonymous.

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THE ALOE APHID, ALOEPHAGUS MYERSI ESSIG

(Homoptera)

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The apterous form of this very interesting introduced aphid was described in the Pan-Pacific Entomologist, Vol. XXVI, No. 1, pp. 22-24, Figs. 1-2, 1950. At the time the original specimens were collected no alate individuals were available. Fortunately, Mr. L. E. Myers, for whom the species was named, recently sent me a considerable number of both alate and winged forms collected on *Aloe* at La Cañada, Los Angeles County, California on February 8, 1951 by W. D. Dyer. A description of the alate forms and an illustration of the same follow.

Alate viviparous parthenogenetic female (fig. 1). Color mostly black excepting the abdomen which is dull greenish with black markings as shown

in the drawing. Short rounded tubercles occur on the head, prothorax and abdomen. A series of wax glands are arranged in transverse groups on the dorsum of the metathorax and the three basal abdominal segments. Small hairs and setae are also present. Antenna 5-segmented with large irregular secondary dorsal sensoria on segments III and IV. These sensoria may be separated or fused. A single large sensorium on IV, as shown, is the rule but it may be divided (in one case) or there may be a large one and a very small one basad (one example). Lengths of segments: III, 0.11 mm.; IV, 0.70 mm.; V, 0.15 mm. The unguis about one-third the length of the base (this also holds for the apterous form in the original description which was erroneously indicated as being twice as long as the base.) Compound eyes and ocelli well developed. The rostrum long and slender and extending beyond the middle of the abdomen, the apical segments only slightly wider than the stem. Prothorax with 4 basal tubercles. Wings with veins and stigma black; venation as illustrated. Abdomen with many lateral and dorsal tubercles and with transverse glandular and pigmented bands. Cauda triangular with many short, curved spine-like hairs. Cornicles absent. Length of body 2.30 mm.; length of forewing 2.97 mm. (Length of apterae 2.20 mm.)

The collection consists of 16 alate and 18 immature and mature apterous forms. The alates are designated as plesiotypes (specimens figured or described as examples of an already named species).

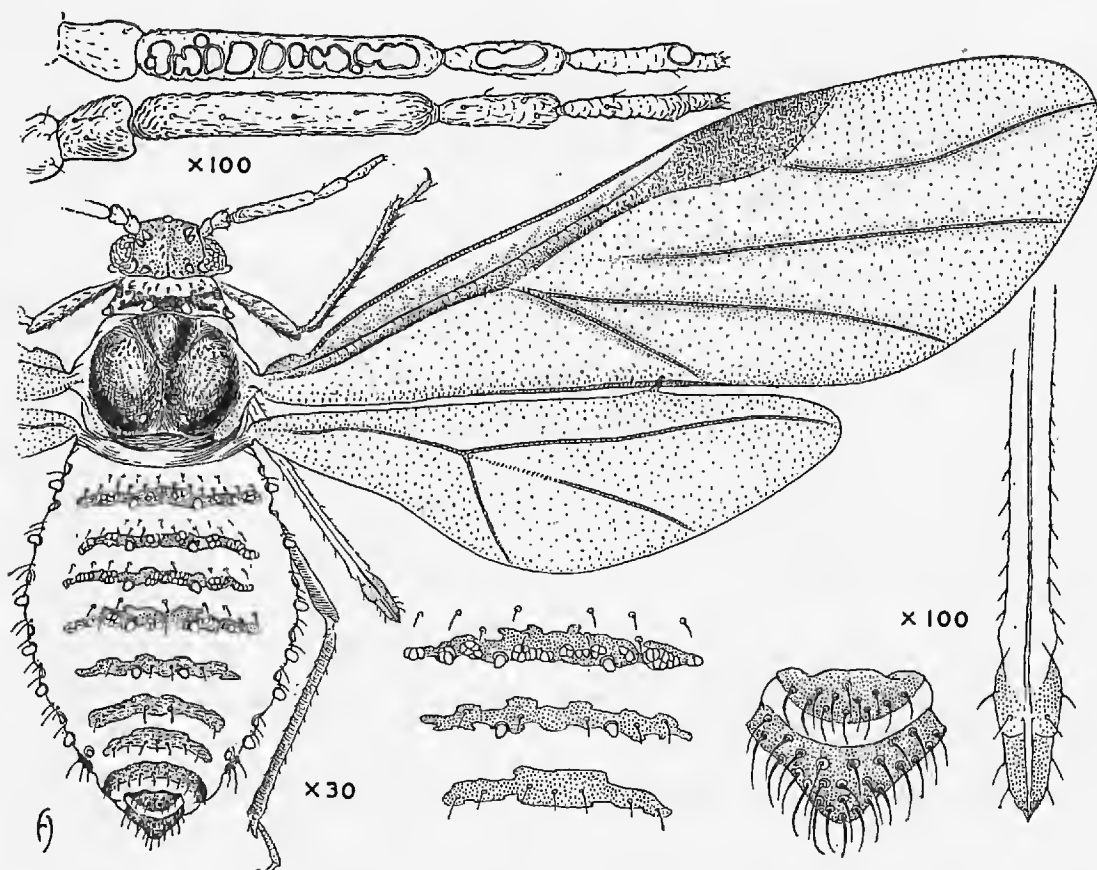


Fig. 1. *Aloephagus myersi* Essig. Alate form (plesiotype) with greatly enlarged antenna, showing dorsal and ventral surfaces; abdominal pigmented, tubercular and glandular areas; anal plate and cauda (ventral aspect); and apical portion of rostrum. (Drawing by Frieda Abernathy).

NOTES ON NEOTROPICAL ARADIDAE,
WITH DESCRIPTION OF ONE NEW SPECIES

(Hemiptera)

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I recently had the opportunity to examine the following rare and curious Aradidae from the Neotropical Region which seem worthy of note.

1. *Calisiopsis ampliceps* Champion, 1898, ♀, Porto Alegre, Brazil, R. P. Buck collector, July 11, 1949. This genus with a single species was described by Champion based on three specimens, two ♀♀ from Bugaba and one from Tolé was somewhat aberrant. The specimen from Brazil agrees with the original description. The genus is new for Brazil, and it is most interesting to note this extension in range from Panamá to southeastern Brazil.

2. *Miorrhynchus longipes* Champion, 1898, ♂, Buena Vista, Santa Cruz, Bolivia, A. Martinez collector, February, 1950. This monotypic genus was described by Champion from a single ♀ specimen from Vulcan de Chiriqui, Panamá. The genus is new for Bolivia. The specimen from Bolivia differs somewhat from the original description and drawings of Champion, the size being slightly smaller, 7.3 mm. (Champion gives the size of his type as 7.0 mm. but Dr. R. L. Usinger, who has recently studied the type, informs me that the size is 7.5 mm.); the fourth antennal segment is slightly longer than in the type of *longipes*, the proportion of antennal segments one to four being: 1:0.46:1.07:0.43 (1:0.47:1.06:0.32 in *longipes* according to the original description and to the measurements which were taken from the detailed drawing of Champion); the third and the fourth antennal segments are infusate but not black at the apex and middle respectively; the genital capsule is as wide as long in the specimen from Bolivia, but Dr. R. L. Usinger informs me that it is slightly longer than wide in Champion's type. Since these differences fall within the limits of possible individual variation, I consider the Bolivian specimen as *Miorrhynchus longipes* Champion (Fig. 1.).

In connection with my study of the genus *Miorrhynchus*, Dr. R. L. Usinger kindly suggested that I might describe a new species

which he had from Panamá. It is a pleasure to dedicate this new species to him.

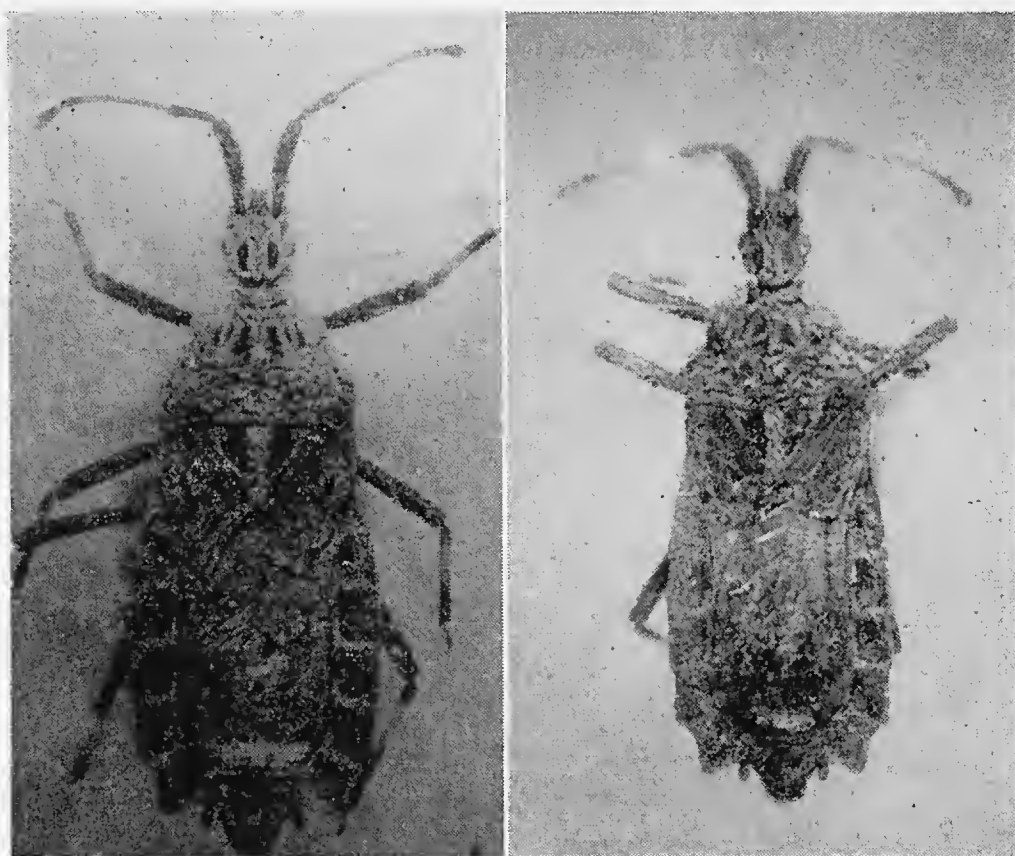
3. *Miorrhynchus usingeri* Kormilev, new species

(Figure 2)

Very similar to *longipes* Champion, but smaller with the general colour more reddish; pronotum somewhat shorter and wider, abdomen shorter and narrower, lateral sutures of the sixth abdominal segment less, and of the seventh more pronounced than in *longipes* from Bolivia (according to Dr. Usinger, Champion's type has the sixth and seventh abdominal segments more strongly produced laterally than in the new species); the third antennal joint shorter, the fourth intermediate between that of Champion's type and the specimen from Bolivia.

Reddish brown; basal half of fourth antennal segment and first tarsal segment lighter, the apex of third antennal segment infusate, tibia with a yellow ring on basal half. Surface partially covered with yellow, truncate, curly hairs. Upper surface mostly and ventral surface almost entirely covered with a yellowish wax-like secretion which is soluble in benzene.

Head subquadrate, longer than wide across eyes (27:21); clypeus stout, conical, anteriorly slightly declivous; antenniferous tubercles directed forwards and slightly inwards, exteriorly almost parallel; eyes not very prominent. Yellow curly hairs absent only on antenniferous tubercles, antennae and two longitudinal, callous, infraocular spots on vertex. Antennae long and slender, their length slightly exceeding that of head, pronotum and scutellum together; first segment large, stout, slightly inflated at middle, as long as head; second segment more slender and shorter, both with stout, truncate, bristly hairs on upper surface, more slender on the second segment; third segment most slender, cylindrical, slightly dilated apically, as long as the first segment; fourth segment short, pyriform, with fine long bristles on the apical half. Proportions of antennal segments one to four: 1:0.48:1:0.37. Rostrum short, yellowish and lying in channel formed by bucculae. *Pronotum* wider than long (53:30), divided into two lobes; anteriorly with a distinct collar. Anterior lobe lower and narrower, with longitudinal elevations laterally and arcuate lateral margin; collar completely and anterior lobe mostly covered with yellow, curly hairs, arranged in longitudinal rows or bordering anterior and lateral margins of lobe. Curly hairs absent only on four (or six?) longitudinal callous spots. Posterior lobe plane, with slightly raised lateral angles and covered with scattered granulation and yellow curly hairs. *Scutellum* triangular, wider than long (28:18), flat, basally inflated and with broad longitudinal ridge; the latter entirely and lateral margins of scutellum basally covered with curly hairs. *Hemelytra* reaching hind margin of tergum, leaving the connexivum exposed. Corium exceeding front margin of second segment of connexivum; membrane white, hyaline. Lateral margin of corium



Neotropical Aradidae—Fig. 1. *Miorrhynchus longipes* Champion, ♂ ; Fig. 2. *M. usinger* Kormilev, ♂ .

and broad triangle on disc bordered with curly hairs. *Abdomen* regularly dilated to fifth segment: the sixth segment only slightly and the seventh more strongly sinuate laterally. First segment of connexivum with one and the others with two round yellow spots on each segment. Lateral border of tergum, segments of connexivum partially and especially genital capsul (♂) covered with yellow curly hairs. Genital capsule large, conical, a little wider than long (19:17). Ventral surface of abdomen densely covered with a wax like secretion; secretion absent only on callous spots arranged in longitudinal rows, the median row with spots bigger and oval, the three lateral rows (on each side) with spots smaller and round. *Prosternum* with curly hairs located laterad of a very fine and inconspicuous median sulcus; meso- and metasterna plane, somewhat depressed in the middle. Propleura densely and mesopleura scarcely covered with similar hairs. *Femora* regularly dilated towards apex and covered with numerous rows of setigerous tubercles; setae stout, truncate, yellowish and semi-erect. Tibiae with finer and smaller bristles. Total length, 6.8 mm., pronotal width, 2.1 mm. and width of abdomen, 2.5 mm.

Holotype: ♂, PANAMA CANAL ZONE, BARRO COLORADO ISLAND, N. Banks collector, July 23, 1924, deposited in the collection of the

Museum of Comparative Zoölogy, Harvard University.

4. *Aphleboderrhis pilosa* Stål, 1860, 11 ♂♂, 14 ♀♀ and 1 nymph, Siambon, Tucumán, Argentina, J. M. Bosq, collector, July, 1933; 4 ♂♂ and 5 ♀♀, Tucumán, Argentina, Dr. P. Wygodzinsky collector, Sept. 24, 1949.

RESUMEN

El autor menciona nuevas procedencias de varios géneros de Aradidae neotropicales y describe una especie nueva del género *Miorrhynchus* Champion de Panamá, dedicándola al Dr. Robert L. Usinger, Professor Asociado de la Universidad de California, Berkeley, USA.

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NEOTROPICAL SCOLYTOIDEA V.-119. CONTRIBUTION TO THE MORPHOLOGY AND TAXONOMY OF THE SCOLYTOIDEA

KARL E. SCHEDL

Lienz, Austria

Mr. Hugh B. Leech of the California Academy of Sciences has sent to me two larger lots of bark and ambrosia beetles collected in various parts of the world. Going over the results of the determinations made it seems worth while to provide a list of the species originating from Lower California, Mexico and other parts of America including the description of one new species. Records of species found outside from the America continent will be published elsewhere.

NEW RECORDS

Renocis parkinsoniae Blackman—Lower California: 25 miles S. Santa Rosalia, VII-25-1938, Michelbacher & Ross collectors.

Coccotrypes dactyliperda Fabricius — Lower California: Comondu, VII-22. 1939, Michelbacher & Ross collectors.

Dendroctonus mexicanus Hopkins—Mexico: 15 miles S. El Guardia Distrito Federal. XI-14-1946, E. S. Ross collector.

- Plesiophthorus luteolus* Schedl—Lower California: Triunfo, VII-13-1938; 15 miles W. La Paz, VII-5-1938, both Michelbacher & Ross collectors; Gulf of California: Angeles Bay, June 27, 1921, J. C. Chamberlin collector.
- Plesiophthorus californicus* Schedl—Gulf of California: Angeles Bay, June 27, 1921, J. C. Chamberlin collector.
- Xyleborus badius* Eichh. Mexico: Tamazunchale, San Luis Potosi, XI-23-1946, E. S. Ross collector.
- Xyleborus torquatus* Eichh.—Mexico: Tamazunchale, San Luis Potosi, XI-1946, E. S. Ross collector.
- Xyleborus vagabundus* Schedl—Lower California: 15 miles W. La Paz, VII-5-1938; 20 miles N.W. La Paz, VII-16-1938; Todos Santos, VII-15-1938; 8 miles N.E. Cape San Lucas, VII-10-1938, all Michelbacher & Ross collectors.
- Xyleborus scopulorum* Hopkins—Mexico: 15 miles S. El Guarda Distrito Federal, XI-14-1946, E. S. Ross collector. Lower California: Todos Santos, VII-15-1938; 5 miles S. Miraflores, VII-10-1938; 20 miles N.W. La Paz, VII-16-1938, all Michelbacher & Ross collectors.
- Xyleborus volvulus* Fabricius—Lower California: 15 miles W. La Paz, VII-5-1938; 20 miles N.W. La Paz, VII-16-1938; 5 miles S. Miraflores, VII-10-1938; Todos Santos, VII-15-1938, all Michelbacher & Ross collectors.
- Platypus sulcatus* Chapin—Argentina: Prov. Salta, Tablillas, IX-1933 to II-1934; Prov. Salta, Macueta, X-XI-1933, both W. C. Harrington collector.
- Platypus inaccessus* Schedl—Mexico: 15 miles N. Tamazunchale, San Luis Potosi, XI-24-1946, E. S. Ross collector.
- Platypus ustulatus* Chapin—Mexico: Veracruz, Dr. A. Fenyès.
- Platypus ratzeburgi* Chapin—Puerto Rico, Consumo Mayaguez, ex *Inga vera* killed by mal de goma, George N. Wolcott collector
- Platypus pulicarius* Chapin—Argentina: Tartagal, Prov. Salta, W. C. Harrington collector.
- Platypus rugulosus* Chapin—Mexico: Cordoba, Veracruz, Dr. A. Fenyès; Oaxaca, Zaachila, 4500 ft., VII-21-1937, M. A. Embury collector; 15 miles S. Iguala, Guerrero, XI-15-1946, E. C. Van Dyke; 15 miles N. Tamazunchale, San Luis Potosi, XI-24-1946, E. S. Ross collector.
- Bolivia: Rurrenabaque, VIII-1925, G. L. Harrington. Argentina: Prov. Salta, Tablillas, XII-1932 to IX-1933, W. C. Harrington.
- Platypus punctulatus* Chapin—Panama: ex-bananas, IX-8-1932. Canal Zone: Ft. Clayton, VII-10-1945, K. E. Frick; Barro Colorado I., VII-21-1944, K. E. Frick; Argentina: Prov. Salta, Gen. Ballivian, III-IV-1927, G. L. Harrington.
- Tesserocerus dewalkei* Chapin—Argentina: Prov. Salta, Tablillas, IX-1933 to II-1934, W. C. Harrington collector.
- Tesserocerus dejeani* Chapin—Mexico: Veracruz, Dr. A. Fenyès.

***Plesiophthorus californicus* Schedl, new species**

Dark reddish brown when fully mature, 1.9 to 2.1 mm long, 2.6 times as long as wide. More closely allied to *Plesiophthorus perspectus* Schedl and of similar size but the pronotum and elytra

more coarsely sculptured, the elytral striae more strongly impressed, the elytral declivity with the lateral convexities somewhat more pronounced and the space between more distinctly aplanate.

Front broad, coarsely sculptured, densely punctured to granulate-punctate, with an irregular shallow median impression and a slight indication of a short transverse carina above; pubescence inconspicuous and short. Antennae and front leg with all typical characters of the genus. *Pronotum* somewhat longer than wide (27.0 : 24.4), posterolateral angles rectangular and distinctly rounded, sides parallel to somewhat beyond the middle, thence obliquely incurved to the rather narrowly rounded apex, the anterior construction merely indicated, anterior margin with several low asperities, summit somewhat in front of the middle, a transverse despression behind; anterior area very densely but rather finely asperate, basal area very densely granulate-punctate; pubescence short. Scutellum moderate in size, somewhat longer than wide. *Elytra* as wide and 1.4 times as long as the pronotum, sides parallel to far beyond the middle, apex very broadly rounded, the postero-lateral angles well developed (much better than in its next relative *Plesiophthorus perspectus* Schedl), cylindrical, declivity short, steeply oblique, with the suture but feebly raised below; disc with regular rows of coarse, very densely placed punctures in somewhat impressed lines, the interstices narrow, more narrow than the striae, each with a row of much smaller punctures; declivity with the striae punctures smaller, the striae themselves much deeper, the interstices comparatively wider and the interstitial punctures more distinct and much more closely placed; the pubescence dense and short originating from both series of punctures, those of the striae and that of the interstices.

Holotype and *paratypes* from ANGELES BAY, GULF OF CALIFORNIA, June 27, 1921, J. C. Chamberlin collector; holotype and some paratypes deposited in the collections of the California Academy of Sciences. Additional paratypes are in the collection of the writer.

The size and even the proportion do vary to some extent in the seven specimens before me but I can not find any distinct sexual differences. Perhaps the more slender specimens are females, the stouter ones males.

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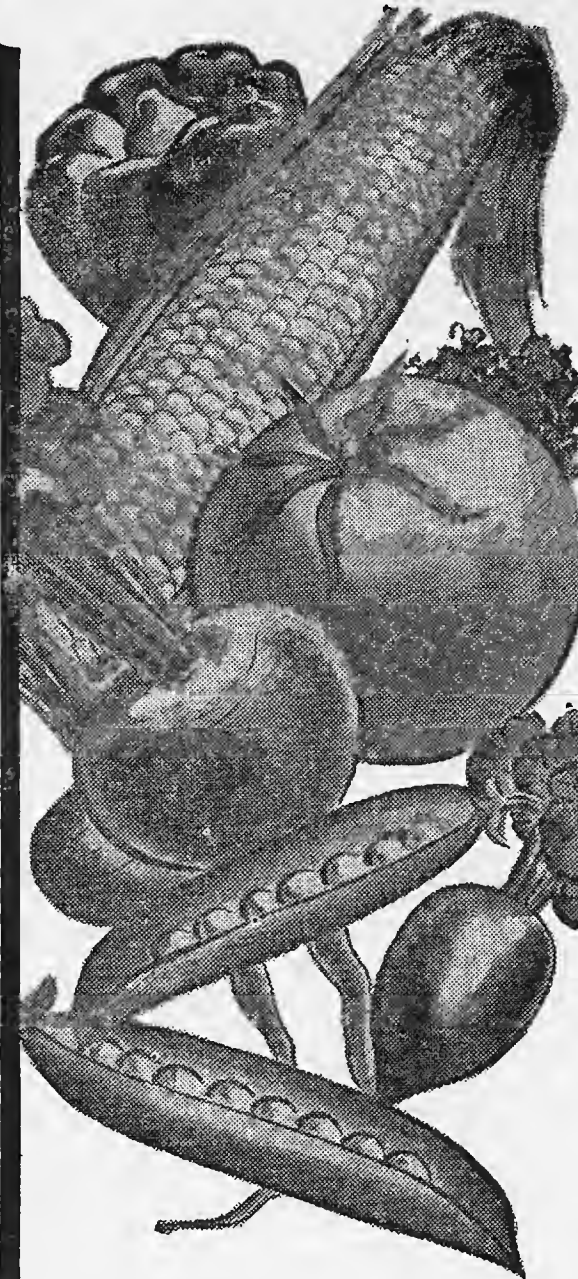
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PAN-PACIFIC ENTOMOLOGIST



Published by the
Pacific Coast Entomological Society
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Published quarterly in January, April, July, and October with Society Proceedings appearing in the January number. Papers on the systematic and biological phases of entomology are favored, including articles up to ten printed pages on insect taxonomy, morphology, life history, and distribution.

Manuscripts for publication, proof, and all editorial matters should be addressed to H. B. Leech at the California Academy of Sciences, Golden Gate Park, San Francisco 18, Calif., or to P. D. Hurd, Jr., at 112 Agricultural Hall, University of California, Berkeley 4, Calif. All communications regarding non-receipt of numbers, changes of address, requests for sample copies, and all financial communications should be addressed to the treasurer, Dr. R. C. Miller, at the California Academy of Sciences, San Francisco 18, Calif.

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Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

The Pan-Pacific Entomologist

Vol. XXVIII

July, 1952

No. 3

BRIGHTON CLARK CAIN

The passing of B. C. Cain on May 19, 1951, is a severe loss to western entomology. "Bugs" Cain, as he was known to generations of Boy Scouts, graduated in Entomology at Stanford University in 1923. He took a Master's Degree at Stanford devoting his research to the biology of the European earwig which, at that time, was a recent immigrant to California.

Mr. Cain was not a professional entomologist. He never published a paper in the field, and, although he kept up his membership in the Pacific Coast Entomological Society (1923 to the time of his death), he rarely attended meetings.

For a quarter of a century, "Bugs" Cain devoted himself exclusively to young people. As Naturalist of the Oakland Council, Boy Scouts of America, he inspired countless boys at Dimond Camp in the Oakland Hills and at Dimond "O" Camp near Yosemite. His enthusiasm was contagious. How many of his proteges actually went on to careers in science may never be known but at least one group of six professional entomologists arranged an anniversary dinner in his honor some years ago and bound their scientific publications into a sizable volume which they dedicated to him.

Since his death a "Bugs" Cain Memorial Fund has been raised by grateful friends throughout the world. Upon conclusion of the drive, the funds will be delivered to the City of Oakland for the construction of a Nature Study Building in Lakeside Park. This seems particularly appropriate because Lakeside Park was the place where scouts convened at an early hour on many a cold morning for bird hikes. In retrospect, one can say of "Bugs" Cain that here was a truly great man who lived not for himself but for the inspiration that he gave to others.—ROBERT L. USINGER.

NEW BOMBYLIID FLIES REARED FROM
ANTHOPHORID BEES

(Diptera: Brachycera)

FRANK R. COLE

Redlands, California

While studying colonies of anthophorid bees, *Diadasia conso-ciata* Timberlake, and *D. bituberculata* (Cresson) in California, E. G. Linsley, J. W. MacSwain and R. F. Smith of the University of California reared three species of bombyliids from the nests of these bees. The flies were sent to me for identification, and all proved to be undescribed.

Two of these flies are rather closely related species belonging to the genus *Villa* (subgenus *Paravilla* of Painter) in the now generally accepted classification of the family; the third parasite is an interesting species of the genus *Anthrax* (a group better known in the literature under the generic names *Argyramoeba* and *Spogostylum*), very closely related to *Argyramoeba daphne* of Osten Sacken. I have compared these flies with various related forms in my collection in the California Insect Survey and collection of the University of California.

Many of the bombyliid flies are well known parasites of bees and wasps, or have been discovered living in their nests as inquiline. Fabre has written a most interesting account of the Anthrax Fly (*Anthrax trifasciata*) and its relation to the "wall bee," *Chalcidoma muraria* Retzius, in France. *Villa edititia* Say, related to the two species of *Villa* described in this paper, has been reported as a parasite of ground nesting bees of the genus *Anthophora*.

***Anthrax nidicola* Cole, new species**

(Figure 1)

The basic body color is black, but the species has a gray appearance. The wings are largely hyaline, with a few small, pale clouds; an extra crossvein forms three submarginal cells.

Head black, with a dull, iron gray "finish" (the texture too fine to be termed pollen), more hoary on the sides. Face and frons with short, erect, black hair, mixed with some yellowish at sides of oral margin; yellowish tomentum visible between this hair; tomentum of occiput finer and paler. Antennae satiny, gray black, of characteristic form, with black hairs on segments I and II. *Mesonotum* and *scutellum* gray black in color, dorsum covered with short, fine, dull golden tomentum, coarser and more dense on *scutellum*, on *mesonotum* appearing as broad stripes; some sparse black pile and black bristles on sides of *mesonotum* and on *scutellum*. The ruff is yellowish to white, with a few black hairs above. *Pleura* gray black, with

long bushy pile, which ranges from white to golden in color. Coxae with mixed black and yellowish bristles. *Abdomen* gray black, slightly more shining than thorax; as wide as thorax at base, tapering as in typical species of the genus; first tergite slightly longer than III, IV or V, second tergite longer than any other two tergites combined; first segment tufted with white hair on each side. In well preserved specimens (which are rare) there is

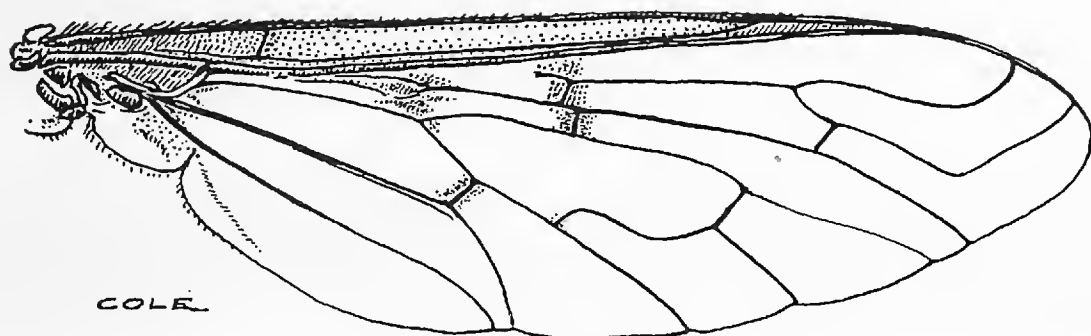


Fig. 1—Wing of *Anthrax nidicola* Cole.

a rather dense covering of tomentum on the abdomen, denser on sides and near apex, most of which is shining, snowy white, but golden brown at base of second tergite, and a few brown scales evident on third and fourth. Dorsum of abdomen with sparse, black, rather recumbent bristly hairs. Incisures yellowish red, widening apically (in a few specimens tergites VI and VII mostly reddish). Hypopygium largely reddish, the large dorsal valves semi-translucent, pale mahogany, the ventral plate with strong black hairs. Venter largely gray black, posterior margins of sternites reddish, and with a covering of whitish tomentum and sparse golden pile. Stem of halteres yellowish brown, knob honey yellow, tipped with ivory. *Femora* and last four tarsal segments black, the tibiae reddish. Bristles of the legs black. Pulvilli well developed. Legs with pale tomentum, the fish-scale tomentum of femora silvery. Wing (fig. 1) largely hyaline, pale brown at extreme base; veins heavy, black; costal cell grayish; a square blackish brown spot at middle of first basal cell (2nd R), and a brown spot on anterior crossvein and on the squared base of first submarginal (3rd R) where there is a stump of a vein; very narrow brown clouds at bases of third and fourth posterior cells. Three submarginal cells in all specimens examined, as in the type, a strong crossvein connecting the anterior branch of third vein (R_4) with the second vein (R_{2+3}). Length 6.5 mm.

Female. With the same basic coloring and marking as in the male. Less pile on the pleura, and pile of coxae more white. Dorsum of the abdomen mottled with white tomentose patches, and with spots of black tomentum tergites II, III and IV; some brownish tomentum scattered on dorsum. More blackish pile on abdomen than in male, some black pile mixed with the yellowish on venter. Genital segment with close-set, incurved, golden pile. Length 7 to 8 mm.

Holotype: Male from TRACY, SAN JOAQUIN COUNTY, CALIFORNIA, June 7, 1949, collected by J. W. MacSwain; female allotype from Palo Verde, Imperial County, California, April 8, 1949 (P. D. Hurd); fifteen male paratypes, Tracy, California, May 3 to June

21 (E. G. Linsley, J. W. MacSwain, R. F. Smith), also one from Cottonwood Springs, Riverside County, California, April 26 (L. W. Quate), and two collected at Redlands, San Bernardino County, California, September, 1914 (F. R. Cole).

This interesting species has near relatives in *Anthrax isis* (Meigen) and *Anthrax binotata* (Meigen), from Africa and Europe. It is very close to Osten Sacken's *daphne*, described at length and figured (wing) in volume I of the *Biologia Centrali-Americana*, but this species is usually larger, has only two submarginal cells, and most of my specimens are more dull brownish in general color, with smaller wing clouds, etc. I have a small specimen of *daphne* from Santa Fe, New Mexico; Osten Sacken stated: "Length 10 millim., but much smaller specimens occur."

Villa apicola Cole, new species

Body dull, gray black, first two antennal joints, face, femora, tibiae and bases of tarsi yellowish in ground color. Structural characters rather typical of the subgenus *Paravilla*. Wings brown on basal half, the color slanting from end of costal cell through middle of discal cell and into the apical fourth of the anal cell.

Male. First antennal joint about twice the length of second, the third joint long conical at base, this black basal portion half the length of third joint and equal to first and second joints combined. Frons at vertex little wider than base of third antennal joint. Face projecting, but not truly long conical; the face and frons with ochre yellow tomentum and with short proclinate black bristles; dense tomentum of occiput ochre yellow. The proboscis is not projecting. *Pile* and tomentum of thorax yellow to golden, fairly short; whitish pile over wing base; pile of pleura mostly longer, yellow to whitish yellow. Scutellum black, yellow tomentose and pilose. The thoracic bristles yellow. The halteres yellowish. *Abdomen* on dorsum with a dense covering of fine golden yellow tomentum. Abdominal pile sparse, yellow, denser and more bushy on sides and at base. Venter reddish on apical half, all the pile and tomentum yellowish. Abdomen without black tomentum. *Femora* and tibiae with yellow, appressed tomentum; basal half of tarsi yellow in ground color, apical joints blackened. Front claws almost equal to others in length, the front tibiae noticeably bristled. Wings more than half gray hyaline; brownish basal color runs with a vague outline from tip of costal cell back through basal third of first posterior cell, the middle of discal cell, and bases of third and fourth posterior cells and apex of anal cell; the auxiliary cell is broadly margined gray hyaline; veins are black, strong and with no indication of three submarginal cells, a character we find in the related species described in the paragraphs following this; the anterior cross-vein is about opposite the middle of the discal cell. Length 6 mm.

Female—Similar to the male. The frons is broader at the vertex (being twice the width of the third antennal joint at its base and about twice the

width of the ocellar tubercle). The face is more typically conical than in the male. The pile on head and mesonotum is about the same as on male; the tomentum on the occiput is more whitish, and there is whitish tomentum on the sides of the long second abdominal tergite.

Holotype: Male, *allotype* female, and paratypes from TRACY, SAN JOAQUIN COUNTY, CALIFORNIA, April 26, 1949, reared from cells of the bee *Diadasia consociata* Timberlake.

Villa (Paravilla) tricellula Cole, new species

Body black, except for the reddish color of first antennal joint and genitalia, and portions of face, femora and tibiae. The principal characters are typical of Painter's subgenus *Paravilla*, which was based on *edititiodes* Painter (Jour. Kans. Ent. Soc., VI, p. 10). The wings are brown on the anterior proximal portion, and on the anterior and posterior crossveins. There are three submarginal cells (See Fig. 2).

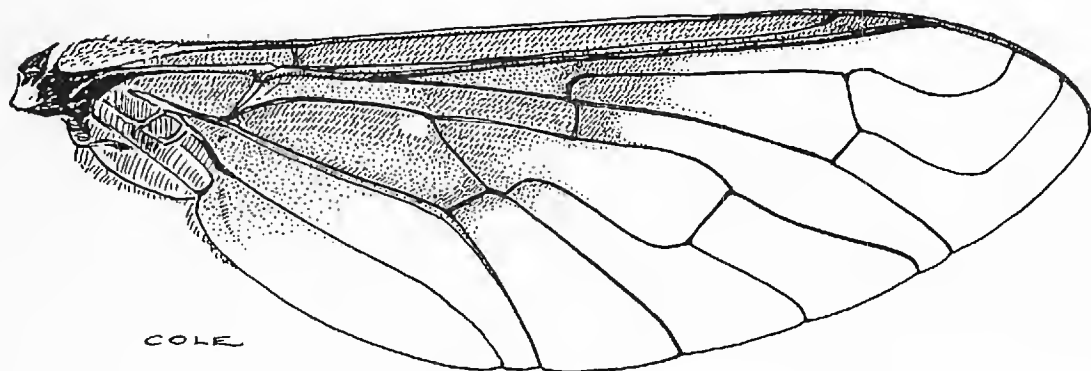


Fig. 2. Wing of *Villa (Paravilla) tricellula* Cole.

Female—The ground color of most of the body is black, gray dusted to semi-shining. First antennal joint about one-third longer than second, dull reddish in color, second joint with a slight reddish tinge (not noticeable in some specimens). Third antennal joint black, long conical at base, the styliform portion slightly longer than base. The orange yellow face is projecting and conical, the proboscis extending only slightly beyond oral margin. Frons and face with yellowish tomentum and short black pile, the pile erect on frons and more abundant on lower third; tomentum of vertex yellowish, silvery white on the rest of the occiput. Pile and tomentum of thorax largely dull yellowish, some white and more shining on scutellum, above wing base and on lower pleura. Bristles of mesonotum and scutellum golden yellow. Yellowish pile longest on collar or ruff and on mesopleura. Halteres yellowish. Abdomen gray black, semi-shining, rather densely pilose, and with a covering of narrow tomentum-scales in well preserved specimens; the pile mostly white anteriorly, where it is longest and semi-erect. Narrow posterior borders of black, bristly pile on second and following segments, this pile more abundant posteriorly; some of tomentum on dorsum straw yellow. Pile of first sternite white, the balance of venter yellow pilose and tomentose. Femora yellow; tibiae yellow, darker at tips, the tarsi blackish. The bristles

of legs black, quite apparent on front tibiae. Front claws as large as others. Femora and tibiae with dense yellowish tomentum. *Wings* are largely hyaline, gray brown on anterior proximal portion, and not filling much of the basal portion of discal cell; discal, anal and auxiliary cells largely hyaline in the type (slightly more clouded in some specimens); veins heavy and black; a strong crossvein connects third and fourth veins (R_{2+3} and R_4), forming three submarginal cells in all of the type series. There are strong clouds on anterior crossvein (r-m) and posterior crossvein (m). *Length* 10 mm.

Holotype: Female and 16 paratypes were reared from cells of *Diadasia bituberculata* (Cresson) collected by E. G. Linsley and J. W. MacSwain at BARRETT SPRINGS, SAN DIEGO COUNTY, CALIFORNIA, on April 20, 1950.

It is most unusual to rear a group of seventeen parasite specimens (at least in Diptera), all of one sex. Among the paratypes is a freak specimen, having one wing with several spur veins along R_s and extra crossveins forming three discal cells.

I have what I take to be *Villa (Paravilla) edititoides* Painter from Lassen County, California (also some related forms which are undescribed), and this species has much more of the wing shaded brown. Painter placed in his subgenus *Paravilla* the following species: *consul* (Osten Sacken), *cuniculus* (Osten Sacken), *pallita* (Loew), *diagonalis* (Loew), *obscura* (Coquillett), *lacunaris* (Coquillett) and *nemakogensis* (Graenicher).

Specimens of a closely related and apparently undescribed fly were taken in San Antonio Valley, Santa Clara County, September 14, by P. D. Hurd; this form has *two* submarginal cells, the wings slightly more infuscated, abdomen with white tomentum and less black, bristly pile, and with small triangles of black tomentum on second, third and fourth tergites.

BOOK NOTICE

THE SCRUB-TYPHUS AND SCRUB-ITCH MITES (TROMBICULIDAE: ACARINA) OF THE ASIATIC-PACIFIC REGION. By H. Womersley. Published by the South Australian Museum as Vol. X of the Museum Records. Paper covers. Part I, 436 pp., 4 text figs.; Part II, 240 pp. containing 120 pls. of line drawings opposed by the legends.

According to a press notice: "The family, subfamily and genera are fully keyed. The classification hitherto largely based on larvae is revised on adult and nymphal characters. . . . Total species mentioned . . . 255." Price 3 pounds, 3 shillings (Australian). The issue is limited; orders should be sent to The Director, South Australian Museum, North Terrace, Adelaide, South Australia.

NOTES ON SOME EFFECTS OF PARASITISM UPON
A SMALL POPULATION OF DIADASIA
BITUBERCULATA (CRESSON)

(Hymenoptera: Anthophoridae)

E. G. LINSLEY AND J. W. MACSWAIN

University of California, Berkeley

On several occasions, in the course of studies of the biology of bees, the writers have found abandoned nesting sites of gregarious ground-nesting species. In some cases the disappearance of the bees could be attributed to an extended period of drought or some other physical factor in the environment. However, a few cases did not appear explicable on any such basis and, since abundant evidence was present that there had been a high incidence of parasites and predators in the population, it was suspected that biotic factors might have played an important role in the disappearance of the bees. It may therefore be of interest to report observations on the effects of parasitism on a population of *Diadasia bituberculata* (Cresson), in which the net result was to reduce the population to such a low level as to virtually exterminate it.

Diadasia bituberculata is a gregarious, ground-nesting anthophorid, which collects pollen from *Convolvulus arvensis* Linnaeus. Its nesting habits are similar to those of *D. consociata* Timberlake which will be described elsewhere (Linsley, MacSwain & Smith, 1952a) although the pupal period is apparently shorter (23-25 days). The nesting site involved in the following observations extended for about 50 feet along a hard-packed, rarely used dirt road near Barrett Springs, San Diego County, California. When the site was discovered on April 20, 1950, there were indications that large numbers of cells had been provisioned during the previous season although but two male bees were in evidence about the area. A sample of 337 cells was removed at this time. These were examined on April 25 with the results indicated in Table I. When the site was revisited in July 1950, no adult bees were evident and sampling failed to yield any living bee larvae or cell series which had been provisioned during the 1950 season.

Molds, as is often the case with ground nesting bees, took a large toll in bee cells. In the sample examined 34 per cent of the cells contained mold which had apparently destroyed the cell con-

tents. *Aspergillus flavus* Link¹ was the prevalent species, although several species of *Rhizopus*¹ were also present. These last may have been secondary invaders and may be saprophytic.

Villa (*Paravilla*) *tricellula* Cole² was by far the most important insect parasite encountered in the nest area. Twenty-seven per cent of the cells examined contained larvae or pupae of this species. When allowance is made for the bombyliid larvae destroyed directly or indirectly by mold, it is obvious that the number of cells originally infested was much higher. Actually, *Villa* succeeded in destroying 41 per cent of those bee larvae in our sample which were not destroyed by mold. Undoubtedly many of these larvae had also been attacked by *Rhipiphorus* or *Photopsis*, both of which would also be destroyed by *Villa*.

Rhipiphorus diadasiae Linsley and MacSwain destroyed bee larvae in 18.5 per cent of the non-moldy cells examined, although this figure would be higher if bee larvae containing this parasite which were destroyed by *Villa*, *Photopsis* or *Lytta* could be determined. From these figures involved it is estimated that approximately thirty per cent of all cells were originally infested with Rhipiphorid larvae. The feeding habits of this species are like those to be reported in detail elsewhere for *Rhipiphorus smithi* Linsley and MacSwain, (LINSLEY, MACSWAIN AND SMITH, 1952b). The external feeding period, period between completion of feeding and pupation, as well as the pupal period were obtained for 10 specimens of *R. diadasiae*. These periods in sequence averaged 6.3 days (range 6-8); 4.9 days (range 3-7); and 12.9 days (range 11-15). The fragmentary biological observations on this species differ markedly from the more complete study of *R. smithi* in one important detail. In *R. smithi* over 99 per cent of the adult beetles escaped from the soil whereas a high percentage of *R. diadasiae* failed to reach the surface. However, this latter circumstance might well have been due to some purely local condition where the study was made.

Photopsis auraria Blake³ has been reported previously as a parasite of *Anthophora linsleyi* Timberlake (Linsley and McSwain, 1942). As far as could be determined its habits as a parasite of

¹Identified by E. A. Steinhaus, Division of Biological Control, University of California, Berkeley, California.

²Identified by F. R. Cole, Redlands, California.

³Identified by C. E. Mickel.

Table I. — Parasites and predators in a nest sample of *Diadasia bituberculata* (Cresson) examined April 25, 1950¹.

Material examined and stages present	Number of cells	Per cent of total	Per cent of non-moldy cells (248)
Cells sampled	377	100.0	100.0
Unparasitized <i>Diadasia bituberculata</i>			
overwintering larvae	32	12.5	
adults	15		21.8
Bees (adults) dead from unknown causes	7	1.9	
Cell contents destroyed by molds	129	34.2	
<i>Villa (Paravilla) tricellula</i> (Bombyliidae)			
larvae	84		
pupae (including 7 dead)	18	27.1	41.1
<i>Rhipiphorus diadasiae</i> (Rhipiphoridae)			
larvae (endoparasitic first instar)	12		
pupae	2	12.1	18.5
adults (including 26 dead)	32		
<i>Photopsis auraria</i> (Mutillidae)			
larvae	5		
pupae	8	5.3	8.1
adults (including 3 dead)	7		
<i>Photopsis</i> sp. (Mutillidae)			
larvae	11	2.9	4.4
<i>Lytta melaena</i> (Meloidae)			
larvae	11	4.0	6.1
pupae	4		

¹All identifications based upon reared adults.

D. bituberculata are as described for *Anthophora*. Seven females and six males were ultimately reared. The females were identified by C. E. Mickel as *P. auraria* Blake, 1879 and the males as *P. nebulosa* Blake, 1886. On the basis of habits, cocoon structure, and coincidence of emergence we regard them as a single species, *Photopsis auraria* Blake, a conclusion also suggested by Dr. Mickel (*in*

litt.). Emergence dates for the females ranged from April 20 to May 23, the males, with one exception, from April 28 to May 18. One male, however, did not pupate until May 18 and did not transform until June 19. 5.3 per cent of the cells examined contained *P. auraria*, which had parasitized 8.1 per cent of the bee larvae not killed by mold, *Villa* or *Lytta*.

Photopsis sp., represented by 11 larvae from which six females were ultimately reared, is smaller than *P. auraria*, the larvae construct a more delicate cocoon, and adults did not emerge until July. Whether these specimens were retarded in development by our methods of laboratory rearing or whether they actually represent a different species remains to be determined. This form was found in 2.9 per cent of the cells examined and had destroyed 4.4 per cent of the bee larvae which were not destroyed by mold, bombyliids or meloids.

Lytta melaena (LeConte) may have had a greater effect on the host bee than that indicated in Table I. The fifteen larvae and pupae were found in resting cells removed from the series upon which the earlier larval stages had fed. Since larvae of several species of this genus have been found destroying one or more cells, depending upon the size of the host attacked, it is possible that the larvae of this species may have destroyed two cells each in completing their development. This is a rather large black species whose mature larvae are somewhat larger than the *Diadasia* larva. The authors have observed oviposition in more than twenty species of *Lytta*, including close relatives of *L. melaena*. For this reason it is probably safe to assume that *melaena* follows the normal pattern of preparing a short burrow in the soil to a depth of two to three inches and laying several hundred eggs at the end of the burrow. The incubation period for the eggs of other members of the genus is about two weeks, after which the first instar larvae crawl over the surface searching out new cell series of their host. Although the authors previously (1942) presumed that larvae of *L. occipitalis* Horn contacted the host bees by climbing surrounding vegetation, they now appreciate that this assumption was erroneous. The feeding habit of this genus is apparently that of a specialized predator which consumes the contents of one or more cells regardless of their nature. After the first four feeding instars the larva burrows several inches away from the cell series and constructs a resting chamber. This activity appears to effectively protect the

meloid from parasitism by other members of the community. Of the 15 specimens collected only the four listed as pupae in Table I transformed during the season in which they were collected. The 11 larvae have not yet transformed as of June, 1952. We have previously observed this habit in meloids which attack bees and apparently it is a mechanism to carry the species over unfavorable seasons.

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THE HABITAT OF TWO RARE CALIFORNIAN HISTERIDAE (Coleoptera)

Onthophilus lecontei Horn, 1870, and *Margarinotus remotus* (Leconte), 1859, are among the rarest of Californian Histeridae. As is often the case in rare insects, the rarity is due apparently to the restriction of these species to a special ecological niche seldom investigated by collectors. Dr. F. X. Williams has recently presented the California Academy of Sciences with a series of 14 specimens of *O. lecontei* and 13 of *M. remotus* collected in company with numerous individuals of the common *Saprinus paemosus* Leconte in the nest chamber and burrows of *Thomomys bottae bottae* Eyndoux & Gervais (Botta pocket gopher) at Danville, Contra Costa Co., Calif., February 9, through April 17, 1952.

This is strong evidence that such burrows constitute the normal habitat of these two species. With one exception (a specimen of *lecontei* collected in a gopher burrow at Atascadero, Calif.) all other known specimens have been collected as stragglers during the rare periods when the species ranged out of their normal habitat.—EDWARD S. ROSS, *California Academy of Sciences*.

DESCRIPTION OF A NEW SPECIES OF *AEGUS* FROM
THE SOLOMON ISLANDS, WITH REMARKS ON
OTHER STAGBEETLES

(Coleoptera: Lucanidae)

BERNARD BENESH

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The present paper contains the description of a new species of *Aegus* from the Solomon Islands, a characterization of *Ceratognathus tasmanus* Benesh and *C. westwoodi* Thomson, and a rectification of an error made by the writer in an earlier paper.

Aegus pulverosus Benesh, new species

This new species is sufficiently distinct that a cursory diagnosis will suffice for identification of the insect. Obovate, strongly convex; of olive-gray aspect, the dorsum being covered with very dense, abbreviated pile (giving the insect a pulverous appearance), intermixed with pronounced reddish-brown tufts.

Female—*Head* transverse, anterior margin straight, angles rounded; sides diverging posteriorly and feebly arcuate to opposite the eyes; head cribripunctate, each puncture bearing a tuft of redish-brown pile. Eyes large, parallel. Canthus slightly emarginate anterior to the eye and half-way circumscribing the eyes; postocular section converging to occiput. Mandibles shorter than head, laterally keeled, arcuate, apices acute; inner margin of right mandible with a bifid tooth, that of the left with a single, simple tooth; punctured on top and pulverose, apices and inner margins glabrous, black. Antennae stout, ferrugineous, the three terminal segments forming the clava, which is pubescent. *Pronotum* broader than long, anterior margin nearly straight, anterior angles produced and subacute; sides arcuate to lateral angles, which are obtuse, thence semicircularly excised and converging to base, basal angles obtuse, the base broadly arcuate; tufted irregularly throughout with brownish pile, without apparent punctuation. Scutellum invisible, squamose. Elytra broader than long, humeri rounded, sides arcuate, posterior margins rounded; pulverose throughout, with four, broadly spaced lines of brownish tufts, with alternate tufts between. *Legs* fairly stout and short, punctate throughout, pulverose and linearly tufted; anterior tibiae furcate, with three external spines; intermediate and posterior tibiae with one feeble spine at apical third. *Venter* ferrugineous; pro-, meso- and metasternum, inflexed portion of the elytra, and first ventral sternite shining, cribripunctate, the interior of punctures squamose; last four sterna impunctate, pulverose, and tufted. Mentum slightly broader than long, anteriorly and laterally rounded, base straight.

Male unknown.

<i>Measurements</i> (in millimeters):	Length	Width
Head	1.1	3.0
Pronotum	2.6	4.5
Elytra	4.1	4.7

Holotype: A female from PIVA RIVER, BOUGAINVILLE, SOLOMON ISLANDS, collected by B. D. Valentine in October, 1944. Deposited in the collection of B. Benesh at Chicago Natural History Museum.

CERATOGNATHUS TASMANUS Benesh and C. WESTWOODI Thomson

I have been asked to elucidate the specific differences between *C. tasmanus* and *westwoodi*, in order to facilitate identification of the two species. I do so herewith, utilizing the description of the first and comparing it with a specimen¹ in my collection, that is definitely determined as *westwoodi*. Incidentally, a specimen that had been received from the Australian Museum under the specific name *westwoodi* (identified by Mr. Oke), proved to be *C. flabel-latus* Boileau, a desideratum of long standing. The differences between the two species can be tabulated as follows:

<i>westwoodi</i>	<i>tasmanus</i>
Mandibles slender, arcuate, inner margins laminate and serratulate.	Mandibles at middle angulate, apices bifid, with two obtuse, distant teeth on top, one on the angulation, the other posterior to the apical fork.
Anterior margin of head produced at middle into a blunt point.	Anterior margin nearly straight, simple. Eyes larger.
Sides of pronotum nearly uniformly arcuate from anterior to basal angles.	Pronotal sides diagonally arcuate to middle, thence parallel to basal angles.
Scutellum longer than broad, uniformly cribripunctate.	Scutellum broader than long; punctation circumscribed by an impressed line.
Elytra noncostate.	Elytra with a sutural and two lateral costae.

PLATYCERUS CRIBRIPENNIS Van Dyke

This species, described by Dr. Van Dyke as a variety of *P. piceus* Kirby (= *depressus* LeConte), was declared by me to be just a mutant of *P. marginalis* Casey. This opinion was based upon examination of a specimen whose owner asserted that it had been compared with the type and pronounced a good match².

On a recent visit to the California Academy of Sciences I was able, through the kindness of Dr. Van Dyke, to examine the typical specimens and I found them to be distinctive. However, I do not

¹Taken by the Harvard Australia Expedition on Mt. Kosciusko, New South Wales, 5-7,000 ft., Dec. 12, 1931.

²Trans. Amer. Ent. Soc. LXXII, p. 173, 1946 (footnote).

consider the insects to be variants of *P. piceus*; I believe that they represent a separate species. *P. cribripennis* differs from *P. piceus* in the conformation of the mandibles, the cribriform sculpture of the pronotum, the more clear cut sculpture (with the walls of the punctures more straight, not sloping as in *P. marginalis*, and in its anthracite black color and higher luster. Specimens of *P. piceus* generally have only the head and pronotum feebly shining and the elytra are more or less opaque.

I take pleasure in rectifying my error, and thank Dr. Van Dyke for having made it possible for me to do so. I also wish to thank Mr. Rupert L. Wenzel, Chicago Natural History Museum, for reading and correcting this manuscript and for valuable suggestions.

TWO PALAEARCTIC ORTHOPTERA ESTABLISHED IN THE UNITED STATES

(Mantidae, Tettigoniidae)

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In a lot of several thousand western Orthoptera sent to me for identification from the University of California I found specimens of *Phaneroptera quadripunctata* Brunner and a species of *Iris*. Being unable to arrive at a confident determination of the *Iris* I sent specimens to Dr. B. P. Uvarov of the British Anti-Locust Centre, who has made extensive study of the genus. He informs me that the mantis is *Iris oratoria* (L.) and also reassures me on the identification of the *Phaneroptera*. Specific records are:

IRIS ORATORIA (LINNAEUS)

Brawley, Calif., VII-11-1950, at light, 3 ♂ (K. W. Tucker); Imperial Valley, Calif., 1950, 2 ♂; Shafter, Calif., IX-6-48, 1 ♀ (R. V. C. Bosch); Sanger, Fresno County, X-14-50, 1 ♂ (O. G. Bacon); Palm Springs, VI-11-1940, 2 immature specimens (N. Reynolds); Palms to Pine Highway, 1000, V-24-1940, 1 immature (F. H. Rindge); Cathedral City, VIII-14-50, 1 ♂ (L. W. Isaak); Beaumont, VII-4-47, 1 ♀.

This mantis can be distinguished at once by the two tubercles on the frontal disc and the small spines at the tip of the middle and hind femora. Superficially it resembles a species of *Stagmomantis*.

PHANEROPTERA QUADRIPUNCTATA BRUNNER

Mountain View, Calif., Sept. 9 - Nov. 29, 1941, 4 ♂ and 1 ♀ (Kenneth Frick); IX-13-43, 1 ♀ (K. Frick); Niles, Calif., IX-16-32, 1 ♂.

NOTES ON COCCINELLIDS IN THE
PACIFIC NORTHWEST

(Coleoptera)

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The effectiveness of coccinellids, or lady beetles, in the control of aphids is sometimes underestimated by economic entomologists, probably because it is customary to take note of them only in times of aphid outbreaks. Lady beetles, as well as other natural enemies of the aphids except fungus disease, may be inadequate for control at times when aphids have been given an unusual advantage by weather conditions. It would be better to think of these predaceous insects as ever present and helping to keep down aphid populations every year. Aphid outbreaks would probably be a yearly occurrence without them. As lady beetles are very susceptible to some insecticides, it would be well to consider the possible effect on their numbers of the chemical treatment of large areas.

On the other hand, some people believe that the importation of large numbers of lady beetles into their fields or orchards would be a cheap and easy means of controlling aphids on their property. Their confidence in the effectiveness of these predators has led them to invest in stocks of lady beetles that have been collected in distant areas. Davidson (1924), in California, demonstrated that this practice cannot be of value to the individual grower, because the imported beetles disperse widely after release. This rapid dispersal of imported beetles has also been noted by Packard and Campbell (1926) in the Antelope Valley of southern California, Knowlton *et al.* (1938) in Utah, Eddy (1939) in Louisiana, Garman (1936) in Connecticut, and Hedrick (1934) in New York. Whether or not the region would benefit if large numbers of lady beetles were brought into it would be very difficult to demonstrate.

The habit of some species of coccinellids of collecting in masses in certain restricted locations at certain times has rendered

¹Retired October 31, 1948. In addition to my own notes I have assembled and compiled the notes of several coworkers of the Bureau of Entomology and Plant Quarantine who were located at Forest Grove, Oregon, but I alone am responsible for this arrangement and the conclusions drawn. Among these coworkers were Mrs. S. K. Zimmerman (nee Keen), A. C. Burrill, Max M. Reeher, and T. R. Chamberlin.

their collection for exploitation comparatively easy. The tendency of these species is to return to the same sites year after year, even though the returning beetles themselves have had no previous association with that site. In the West such aggregations have been called lady beetle caches. These caches are susceptible to serious damage by fire at the hands of the ignorant or careless.

Caches, or masses, of lady beetles are much more common than is generally supposed, at least in the West. A. C. Burrill, with the help of employees of the United States Forest Service and others, accumulated reports of lady beetle caches during the period 1918 to 1920. By adding to these reports the definite records made by other workers, we have records of about 25 such caches scattered over the region west of the Cascade Mountains and east of the Coast Range divide, and about 45 in Oregon and Washington east of the Cascade Mountains. Doubtless there are many other cache sites in both regions which have never been reported, as these caches are not easy to discover except at certain opportune times. Similar caches in California were known, and beetle collections were made from some of them for many years (Carnes, 1912). They have also been reported in Nevada (Nunenmacher, 1910), in Utah (Knowlton *et al.* 1938), in Colorado (Gillette, 1923), in New Mexico (Douglass, 1930), in Michigan and in the southeastern United States (Sherman, 1938).

In the Pacific Northwest west of the Cascade Mountains, three species of *Hippodamia* are found in these caches—*quinquesignata* (Kirby), mostly of the spotless or nearly spotless form *ambigua*², *sinuata* Mulsant, mostly of the form *spuria* LeConte², and *convergens* Guérin-Ménéville². Caches of *quinquesignata* and *sinuata* occur in the same localities, on bald, dry hill tops, the highest in the region, such as Bald Peak in the Chehalem Hills about 10 miles south of Forest Grove (discovered by Miss Keen on April 29, 1922), and Peterson's Butte near Lebanon in Linn County (discovered by entomologists from Oregon State College in 1918). Although the caches of these two species occur together, they are not much intermingled, each species tending to bunch up with its own kind, *quinquesignata* usually a little higher up the slope than *sinuata*. They occur well down in the crowns of a bunch grass, fescue, or around wild rose bushes, blackberry vines, and poison

²Determinations were made by P. H. Timberlake in 1920.

oak (mostly *sinuata* in blackberry vines and poison oak) on southwest-facing slopes. Such caches are not easily discovered except when the beetles are assembling in September and October, when basking in the sun on sunny days in early spring, or when leaving in March or April. When the beetles in the bunch grass are disturbed, they "boil up" in large numbers from each grass crown, except in cold weather when they are torpid. *H. sinuata* are usually more numerous than *quinquesignata* in these caches. The mating, or attempted mating, of male *sinuata* with female *quinquesignata* is frequently observed when the beetles are leaving the cache. Pale red *sinuata spuria*² with greatly reduced spots, sometimes altogether spotless, have been found in some numbers in the Bald Peak cache and also in the cache on Peterson's Butte. Typical *quinquesignata* are a brilliant red, whereas the red of *sinuata* is usually much faded, sometimes nearly to yellow.

Cache sites of *Hippodamia convergens* in western Oregon are quite different—usually near water, on stumps, bracken, bushes and small trees in cold damp canyons, such as Clear Creek Canyon six miles northwest of Forest Grove, or on rushes in swampy spots—and the exposure in general is eastern. In a small swampy spot near the Forest Grove reservoir, on October 20, 1926, the beetles were in clumps at the tops of the rushes, giving the impression of exotic bloom. In February 1935, T. R. Chamberlin found a small cache of mostly spotless *convergens* on rushes in a marshy spot on the valley level at the foot of a slight east-facing slope near Rickreall in Polk County. Specimens taken here so closely resembled the spotless form of *quinquesignata* that we were not sure of the species until mounts of the male genitalia proved to agree with Timberlake's (1919) description of *convergens*. Ewing (1913) reported masses of lady beetles on the summit of Mt. Chintimini (now called Mary's Peak), the highest point in the Coast Range of Oregon. He stated that some of the beetles he found cached there were *spuria* LeConte and that others were *convergens* Guérin-Méneville.

The late R. C. Treherne wrote (Nov. 5, 1921) that the lady beetle caches in British Columbia "that face the west are, I believe, *H. 5-signata*, whereas the one facing the east is probably *H. convergens*." This idea had not occurred to us, but our observations on the sites that we have seen confirm Treherne's tentative theory. It would be desirable for someone to make a study of this interest-

ing phenomenon of massing by lady beetles, if he were careful to make accurate determinations. The determination of the species of this genus is very difficult, and the male genitalia must be studied to verify them (Timberlake, 1919, and Chapin, 1946).

Most of the caches that have been reported in the area east of the Cascade Mountains are presumably of *Hippodamia convergens*, but we have seen few specimens from such caches. A form of *caseyi* Johnson that is spotted like *convergens* was noted in numbers near Wenatchee, Washington (Timberlake, 1919). Caches are known to occur on the isolated buttes of the Palouse region as well as in the Blue Mountains. In Okanogan County, Washington, many of the caches, judging from specimens collected by A. C. Burrill in 1918 and 1919, are of *caseyi* Johnson². Knowlton *et al.* (1938) recorded the finding of caches of *quinquesignata* in Utah.

No one knows from how far the beetles come to these caches. We have observed that *Hippodamia sinuata* and *quinquesignata* are not present in the fields near Forest Grove until the beetles have begun to leave the caches on Bald Peak, 10 miles away. It is quite possible that the beetles travel long distances to reach some of the caches, particularly those in the high mountains. The beetles usually come to the caches on Bald Peak in September and October, but in 1931, some were observed in the grass crowns as early as July 16. In that year previously large populations of pea aphids on annual legumes were very greatly reduced in May or in early June. On July 4, 1926, after a similar sequence of pea aphid populations, a picnic party observed *convergens* massing in Clear Creek Canyon. Sherman (1938) has suggested that hibernation does not seem to be the primary reason for massing in the mountains of the Southeastern States. It seems possible that a sudden failure of the food supply might lead some of the beetles to go to the caches earlier than usual. Such sites may afford better chances for survival without food and with a minimum of activity than do fields at lower levels or in warmer situations. The beetles usually leave the caches in western Oregon in April, but sometimes as early as February or March. *H. convergens* appears to leave its caches a few days earlier than do *sinuata* and *quinquesignata*. In any case the beetles leave on days when temperatures are sufficiently high to permit normal activity. Hence the value of introducing them into the fields before that time would be questionable.

Observations on the caches on Bald Peak were made by us in

the fall and spring of each year in the period 1922 to 1942, except in the years 1925, 1928, and 1929. The numbers of the beetles in these caches varied greatly from year to year. The beetles occurred in enormous numbers following a year of great abundance of the pea aphid, *Macrosiphum pisi* (Kalt.), on the field crops, and, conversely, the caches were usually sparsely populated and the area occupied by them greatly reduced when the previous season had been one in which the pea aphid was not abundant in the fields of the surrounding area. In some years there is a considerable mortality among the beetles in the caches and the entomogenous fungus *Beauveria bassiana* (Balsamo) Vuillemin develops on many of them.

That coccinellid larvae and adults are voracious feeders on aphids has been demonstrated by feeding records published by Palmer (1914), Clausen (1915, 1916), Cutright (1924), and Stehr (1930). Such records are not comparable because of differences in the species of aphids fed and the physical conditions under which the experiments were carried on. In 1921 Miss Keen carried on similar experiments at Forest Grove with several species of coccinellids, using *Macrosiphum pisi* as food, at unheated room temperatures (rarely exceeding 70°F.) in May and June for the adults and in July for the larvae. Her findings are abstracted as follows:

Hippodamia sinuata: 5 larvae ate a mean of 306 ± 44 aphids each in a larval period of 21 days (3)³ and 33 to 35 days (2), the most eaten in 1 day by 1 larva being 28. Five adults ate a mean of 380 ± 11 aphids each in 31 days, the most eaten in 1 day by 1 beetle being 21. The average life of the adult beetles in cages was 83 days after collection.

H. quinquesignata: 6 larvae ate a mean of 245 ± 39 aphids each in a larval period of 11 days (2), 17 to 19 days (3) and 33 days (1), the most eaten in 1 day by 1 larva being 30. Four adults ate a mean of 336 ± 8 aphids each in 31 days, the most eaten in 1 day by 1 beetle being 18. The average life of the beetles in cages was 73 days after collection. It should be noted that variations in the length of the larval period, and consequently in the number of aphids eaten, were considerable in the case of this species and also in that of *H. sinuata*.

³Figures in parentheses indicate the number of specimens reared.

H. convergens: 4 larvae ate a mean of 207 ± 7 aphids each in a larval period of 22 to 23 days, the most eaten by 1 larva in 1 day being 27. Two adults ate an average of 308 aphids each in 31 days, the most eaten in 1 day by 1 beetle being 20. The average life of the adult beetles in cages was 67 days after collection.

H. tredecimpunctata tibialis (Say)⁴: 3 larvae ate a mean of 198 ± 2 aphids each in a larval period of 26 to 27 days, the most eaten by 1 larva in 1 day being 15. One adult ate 342 aphids in 31 days, the most eaten in 1 day being 18. This adult lived 59 days after collection.

H. lunatomaculata Motschulsky²: 4 larvae ate a mean of 224 ± 9 aphids each in a larval period of 22 to 25 days, the most eaten in 1 day by 1 larva being 21. Four adults ate a mean of 302 ± 7 aphids each in 31 days, the most eaten in 1 day by 1 beetle being 14. The beetles lived an average of 67 days after collection.

Coccinella trifasciata Linnaeus⁴: 2 larvae ate an average of 175 aphids each in a larval period of 27 days, the most eaten by 1 larva in 1 day being 15. Three adults ate a mean of 295 ± 9 aphids each in 31 days, the most eaten by 1 beetle in 1 day being 19. The beetles lived an average of 85 days after collection.

Cycloneda polita Casey²: 2 larvae ate an average of 148 aphids each in a larval period of 17 to 19 days, the most eaten by 1 larva in 1 day being 15. Four adults ate a mean of 344 ± 12 aphids each in 31 days, the most eaten in 1 day by 1 beetle being 14. The beetles lived an average of 48 days after collection.

These experiments demonstrated that the three species of *Hippodamia* that are known to have the habit of massing in caches, namely *sinuata*, *quinesignata*, and *convergens*, are important predators on aphids in this area. In these counts *convergens* ate fewer aphids than the others.

In the Willamette Valley all these species are common on vetch and alfalfa, and on Austrian winter field peas infested by the pea aphid. Vetch, whether infested by aphids or not, attracts large numbers of coccinellid beetles, as Ewing (1913) has also noted. This is probably because the beetles often feed at the nectaries on the stipules. The same is true for alfalfa. Lady beetles do not appear to be attracted to peas unless aphids are abundant, and it has been our experience that syrphid larvae, often hatched from

⁴Determined by M. C. Lane.

eggs laid on the plant tips in anticipation of aphid infestation, are usually better predators on that host plant than are lady beetles. *Hippodamia lunatomaculata* was noted in abundance only on red clover when the host plants were heavily infested by the clover head aphid, *Anuraphis bakeri* (Cowan). *H. quinquesignata* usually outnumbered other *Hippodamia* on vetch. *H. sinuata* was abundant on alfalfa on April 27, 1933, and on corn in September 1931. *H. tibialis* were not found in large numbers on any of the field crops. *Coccinella trifasciata* was sometimes more abundant than *Hippodamia* on vetch and alfalfa. *Cycloneda polita* was commonly found on vetch and alfalfa. In some years *Adalia bipunctata* (Linnaeus) became abundant on aphid-infested Austrian peas and vetch in some fields. *Coccinella transverso-guttata* Fald. was much more abundant, on alfalfa, east of the Cascade Mountains than in western Oregon. *Hippodamia apicalis* Casey² was also a very common species on alfalfa in eastern Washington and eastern Oregon.

In 1941 and 1942 a rotary trap⁵ was operated at Forest Grove by J. C. Chamberlin, of this Bureau, and I was permitted to examine the catch for coccinellids. In 1941 *Hippodamia convergens* was caught as early as February 19 and 20 at 60°F.; *Adalia bipunctata* on March 6, at 62°, and the first *H. quinquesignata* and *Coccinella trifasciata* on March 7 at 66°. The total catch in 1941, February 18 to May 15, was as follows: *Hippodamia quinquesignata* 694 (possibly some spotless forms of *H. convergens* were included in this count), *Adalia bipunctata* 521, *H. convergens* 477, *Coccinella trifasciata* 347, *Cycloneda polita* 273, *H. sinuata* 173, *H. lunatomaculata* 4, and *Coccinella transversoguttata* 2. As many as 143 *H. quinquesignata*, 113 *H. convergens*, 61 *Cycloneda polita*, and 60 *Coccinella trifasciata* were caught in one 24-hour period on warm days in April and May. The preceding year had been one of pea aphid abundance. The total catch in 1942, April 19 to June 5, was as follows: *Coccinella trifasciata* 185, *Hippodamia sinuata* 129, *H. quinquesignata* 125, *Cycloneda polita* 93, *Adalia bipunctata* 48, *H. convergens* 14. The trap was not set out early enough to get the first movement of coccinellid beetles and it was located in a different place from that in 1941, but the drop in numbers in April and May was striking as compared with 1941.

The conclusions are that coccinellid beetles are worthy of pro-

⁵For description of trap see U. S. Bur. Ent. and Plant Quar. ET-163, 6 pp. (1940) (Processed.) and Mosquito News, 5 (1): 8-16; illus. (1945).

tection, not only from the ignorant or careless but also from well-meaning exploiters of the massing habit of some species, especially as the exploiters may be "robbing Peter to pay Paul." The caches of these lady beetles are valuable natural assets and should be conserved as such. They are more common and widely distributed than is generally known, and no one knows whence the beetles come to them nor whither they go. The caches are vulnerable to fire and some insecticides.

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TRYPANOSOMA CRUZI REVEALED IN CALIFORNIA MICE BY XENODIAGNOSIS

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INTRODUCTION

Brumpt¹ introduced the term xenodiagnosis for a method of detecting trypanosomes in mammal hosts by feeding laboratory-bred reduviid bugs upon the animal. While studying the blood parasites of mammals at the San Joaquin Experimental Range near O'Neals, California, the writer exposed 186 captured mammals to 670 feedings by 612 cone-nosed bugs. The majority of these insects were 1st instar nymphs of the species of *Triatoma* used and 3rd and 4th instar nymphs for the *Paratriatoma*. All bugs were laboratory raised or examined prior to feeding so were known to be free of trypanosomes. The largest number fed on any mammal

*The writer wishes to thank the California Forest and Range Experiment Station and the Division of Zoology at Davis, University of California for use of facilities at the San Joaquin Experimental Range, O'Neals, California; Dr. Fae D. Wood for her constructive criticisms of this manuscript; and Mr. Kenneth Stager of the Los Angeles County Museum for assistance in bat identifications.

was 18, the smallest number being 1 and the average for all mammals 3.6. Since the habits of these bugs affect their value in xenodiagnosis, some observations are recorded below concerning their usefulness in this process.

OBSERVATIONS

The captured mammals included 91 Chiroptera, 92 Rodentia and 3 Lagomorpha. Two Gilbert white footed mice, *Peromyscus truei gilberti* (Allen), were found to harbor *Trypanosoma cruzi* Chagas, the causative agent of Chagas' disease. Not only did blood smears reveal a trypanosome morphologically identical to *Trypanosoma cruzi*, but *Triatoma* fed upon the rodents subsequently revealed developmental forms of *Trypanosoma cruzi*.

One female *Peromyscus truei gilberti*, at time of capture, served to feed 6 laboratory-raised, unfed 1st instar nymphs of *Triatoma protracta*. All of these bugs showed metacyclic *Trypanosoma cruzi* in voluntary fecal samples 104 days after the original blood meal. The male mouse was host to 4 laboratory-raised, unfed 1st instar *Triatoma protracta* nymphs, of which 3 showed trypanosomes in their feces 95 days after feeding on the mouse.

Of the seven slides from the adult female *Peromyscus*, five were blood smears (6-VII-50) and two were thick drop preparations (7-VII-50). Three blood smears of 384, 250, and 299 sq. mm. were negative while 4 broken trypanosomes were seen in a 242 sq. mm. smear and one whole and two broken trypanosomes were found in a 320 sq. mm. smear. This parasite resembled in form the flattened trypanosome illustrated in Plate 2, Figure 31 of Wood¹³. However, the nucleus was rounded, the kinetoplast triangular, and the cytoplasm basophilic with 17 volutin granules. One thick drop slide revealed 5 trypanosomes, the other none. All 6 bugs fed on this mouse were positive as noted above. Two trypanosomes were seen in the fresh blood sample from the left ear under an 18 mm. circular coverglass but not recognized as *Trypanosoma cruzi* at the time.

A single 450 sq. mm. blood smear from the adult male *Peromyscus* was negative and no trypanosomes were seen in the fresh blood sample. Both animals were trapped near the headquarters area where many *Triatoma*, naturally infected with *Trypanosoma cruzi*, were found by Wood¹⁵.

One 12 gram, male white mouse, *Mus musculus*, Experiment 141, was inoculated intramuscularly (right gastrocnemius) with a 0.1 ml. suspension in sodium citrate solution of 3 voluntary fecal samples from a 4th instar *protracta* nymph which had fed on the female *Peromyscus* at O'Neals. Trypanosomes were seen in the blood from the 9th to the 42nd day with the maximum number of 91 counted from two drops of tail blood under an 18 mm. circular coverglass on the 22nd day. Both living and stained trypanosomes were typical blood forms of *Trypanosoma cruzi* as illustrated in Plate 2, Figure 36 of Wood¹³.

Of the 612 cone-nosed bugs, 322 (9 ♂, 15 ♀, 15 fifth, 10 fourth, 3 third, 5 second and 265 first instar nymphs) were *Triatoma protracta* (Uhler), 232 (4 ♂, 7 ♀, 1 fifth, 1 fourth, 2 second, and 217 first instar nymphs) were *Triatoma rubida uhleri* (Neiva), 49 (3 ♂, 4 ♀, 5 fifth, 16 fourth, 14 third, and 7 second instar nymphs) were *Paratriatoma hirsuta* Barber, and 9 (1st instar nymphs) were *Triatoma longipes* Barber. Six hundred twelve bugs were used for one xenodiagnostic feeding, 28 for one additional feeding on a new host and 15 for two additional feedings on new hosts. With those bugs used for the 2nd and 3rd xenodiagnostic feedings, the procedure followed was to feed the bug on the new host after a minimum of 14 days and examine the fresh fecal deposits immediately after each new feeding. The 43 bugs used again for xenodiagnosis of new hosts as well as most of the bugs fed on one host were negative for all feedings as reported above.

The three bugs, *Triatoma protracta*, *T. rubida uhleri* and *Paratriatoma hirsuta*, were under constant observation during the summer period. Usinger⁵ reports respective body lengths as 18, 20 and 12 mm. for adults. From the standpoint of their efficiency for use in xenodiagnosis, *Triatoma rubida uhleri* proved to be the best insect. Some advantages favoring the use of this bug in xenodiagnosis are: rapid feeding on all types of mammals, especially bats and active small rodents; quick recovery from host movement disturbances; more resistance to body damage from handling with fingers or forceps; greater ease of handling with forceps because of longer legs; rapid utilization of the blood meal by adults; greater blood volume intake of all stages but especially 1st, 2nd, and 3rd instars; rapid defecation after engorgement; and greater viability of eggs. Some disadvantages of this bug are: irritation of the host by preliminary quick jabbing of the proboscis; large

blood volume intake of adults and 4th and 5th instar nymphs greatly weakening small rodents; and greater rapidity of motion making capture difficult.

Some advantages for using *Triatoma protracta* in xenodiagnosis are: less irritation to host mammal since contact is made without repeated jabbing of the proboscis; greater ease of handling because of less rapid locomotion; and rapid utilization of the blood meal by adults. Some disadvantages of using this bug are: slower recovery from host movement disturbances to feeding; larger blood volume intake of adults and 4th and 5th instar nymphs; and slower defecation after a complete blood meal.

The use of *Paratriatoma hirsuta* for xenodiagnosis has the following advantages: rapid feeding ability; lower blood volume intake in adults and nymphs; less irritation of host animal by quick jabbing of the proboscis; and longer interval between feedings for all nymphal instars. Some disadvantages are: difficulty in handling because of small size; rapidity of locomotion; and slowness in defecation after engorgement.

DISCUSSION

Although many California mammals have been examined previously, very few xenodiagnoses have been carried out by Wood and Wood¹⁶ and Wood⁷. F. D. Wood⁶ was the first to demonstrate *Trypanosoma cruzi* in the San Diego wood rat, *Neotoma fuscipes macrotis*, by examination of centrifuged blood. She also experimentally infected the Gilbert white footed mouse which is reported here naturally infected with *Trypanosoma cruzi* for the first time. Thus, there are now two mammal hosts known for this trypanosome in California, *Neotoma fuscipes macrotis* and *Peromyscus truei gilberti*.

Dias³ has reported a third mammal host, the Pacific pallid bat, *Antrozous pallidus pacificus* from Pinole, Contra Costa County. Wood⁹ found an anterior nuclear bat trypanosome, *T. vespertilionis*, in blood smears from *Antrozous pallidus pacificus* in 1941. During the summer of 1950, xenodiagnosis of 76 *Antrozous pallidus pacificus*, of which 9 were found by blood examination (8 fresh, 1 dried) to harbor *Trypanosoma vespertilionis*, failed to reveal *Trypanosoma cruzi*. Because of *Triatoma*'s nocturnal flight habits¹², and since both the bats and *Triatoma* were observed flying at night

it may be assumed that the bugs were available as food to the bats¹⁵ In 1946, the writer fed *Triatoma* to *Antrozous pallidus pallidus* in captivity. Adults of both *Triatoma protracta* and *T. rubida uhleri* were chewed and in one instance a female *rubida uhleri* was eaten. Dead adults were rejected after preliminary chewing but live nymphs with and without *Trypanosoma cruzi* were eaten rapidly. Therefore, the trypanosome seen by Dias in 2 of 8 *Antrozous pallidus pacificus* was probably *Trypanosoma vespertilionis*. The conspicuously close proximity of the nucleus to the anterior border of the cytosome in this trypanosome distinguishes it from blood forms of *Trypanosoma cruzi*.

Environmental temperature has been shown by Kolodny⁴ to influence laboratory infections of *Trypanosoma cruzi* in rats, producing milder infections (blood invasions) in summer (June 15th to September 15th) than fall, winter, or early spring. This might explain the low number of positive xenodiagnoses encountered here as compared with the much larger number found in Arizona during the winter, when 4 of 16 rodents revealed infection¹¹.

Brief mention of *Triatoma* feeding habits was made by Wood and Wood¹⁷ for *protracta* and *rubida uhleri* and by Wood⁸ for *rubida uhleri* and *longipes*. All adult bugs are quicker to metabolize their blood meal, thus can be used again at shorter intervals for new suspected hosts. The 1st instar nymphs, because of relatively small volume intake, can be used again at 14 day intervals if the environmental temperature is high enough. Since *Paratriatoma hirsuta* apparently metabolizes its blood meal at all stages more slowly than *T. protracta* or *T. rubida uhleri*, it can not be used at 14 day intervals. However, if sufficient *P. hirsuta* were available, the longer interval is advantageous in the summer, since the bugs need not be examined immediately or fed again for some time.

Even though *rubida uhleri* is faster moving at higher temperatures than *protracta* and about the same as *hirsuta*, the bug is easier to handle with either fingers or forceps because of its larger size and longer legs. *Triatoma rubida uhleri* is the easiest to hold with fingers for squeezing fecal samples and appears to survive rough treatment better than either *protracta* or *hirsuta*. Adult males of all species are difficult to squeeze and therefore should be reserved for voluntary samples since permanent injury usually follows the pressure treatment. Adult females can be squeezed successfully with less

possibility of permanent injury. Damage to reproductive and digestive organs may result from rough handling. Investigators working with *Triatoma* infected with virulent parasites should keep the face well away while squeezing any of these bugs for fecal examinations since at least one laboratory worker has been infected using this technique².

Usually it is advantageous to feed adults and large nymphs on rodents because the large blood sample may reveal light infections. If the animal is needed for further experimentation and is smaller than a white mouse, 20 bugs feeding to capacity at one time may kill the animal. Experimental animals can not tolerate many large bugs feeding on them at one time but can survive the feeding of many 1st instar nymphs as noted by the writer¹⁰.

Other factors favoring the use of *Triatoma rubida uhleri* in xenodiagnosis are the large number of defecations shortly after engorgement and the shorter egg incubation period. The writer¹⁴ has recently recorded data showing an average of 7 voluntary fecal deposits at 91° F. for *rubida uhleri* as against 3 deposits for *protracta* at 91° and 94° F. during the first hour after a full blood meal. Usinger⁵ reports a 16–18 day incubation period for *rubida uhleri* reared under constant temperature and humidity.

SUMMARY

Exposure of 186 captured mammals (91 Chiroptera, 92 Rodentia and 3 Lagomorpha) to 670 feedings of 612 cone-nosed bugs revealed two Gilbert white footed mice, *Peromyscus truei gilberti*, naturally infected with *Trypanosoma cruzi* Chagas. *Triatoma rubida uhleri* is more useful for xenodiagnosis than either *Triatoma protracta* or *Paratriatoma hirsuta*.

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A REVIEW OF THE GENUS *STOMATOTHRIPS* HOOD

(Thysanoptera: Aeolothripidae)

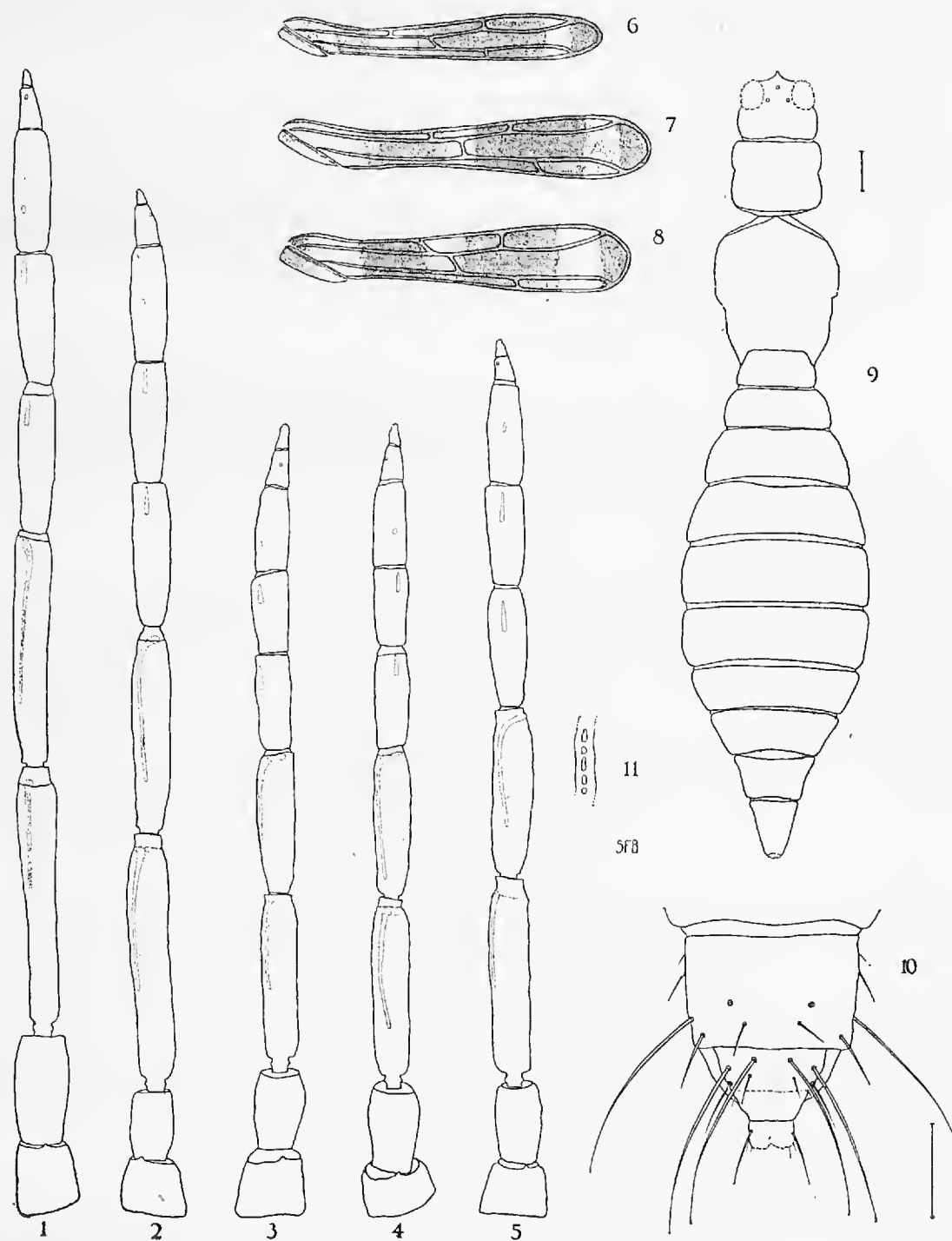
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This small genus of the order Thysanoptera, like most others in North America, is in need of being redescribed and brought up to date. In 1912 Hood described *Stomatothrips* and designated the only species known, *flavus* Hood, as the genotype. Since that time five additional species have been characterized which gives a much broader base on which to set apart this aeolothripid group.¹ Originally it was compared properly with *Orothrips* and *Erythrothrips* Moulton. However, among the species of *Stomatothrips* it is now apparent that the number of segments of the maxillary palpus varies somewhat, but less so than in *Erythrothrips* (Bailey, 1947). Therefore, it is no longer possible to clearly separate these genera (and all species therein) on the basis of this character alone (Bagnall, 1932, Watson, 1923). The genus now can be redescribed to include the characters the known species have in common.

It, no doubt, is presumptuous to attempt to prepare a taxonomic review of a group of insects without having seen any of the types! However, based on the study of five paratypes (three females and two males) of *flavus*, on 52 specimens of *brunneus* (det. Bailey) some of which have been compared with the unique type of *brunneus* by Miss Kellie O'Neill, and two specimens of *septenarius*, one from Trinidad (coll. C. B. Williams, March 29, 1915) and one from Honduras, it is now possible to establish several good reference points to aid present and future thysanopterists in identification and revisional work. In this genus, species are separated by the relative size of wings and antennae and the degree of coloration, which characters are not always constant. Such reliance on color variations particularly is most undesirable but is necessary in this genus until longer series of specimens are taken or the types made available and better anatomical characters discovered.

¹This study is based on 119 specimens representing four species of this uncommon genus. The writer is indebted to Mr. C. F. W. Muesebeck and Miss Kellie O'Neill of the Division of Insect Identification, U.S.D.A., Prof. A. N. Tissot, Univ. of Florida, Dr. C. B. Williams, Rothamsted Experiment Station, England, Dr. H. Priesner, Ministry of Agriculture, Cairo, Egypt, K. Sakimura, Honolulu, Dean Floyd Andre, Iowa State College, L. J. Stannard, Illinois Nat. Hist. Survey, and the Canadian National Museum, Ottawa, for loans and gifts of specimens.



EXPLANATION OF FIGURES

Fig. 1. Antenna of *Stomatothrips flavus* Hood, female. Fig. 2. Antenna of *Stomatothrips flavus* Hood, paratype male. Fig. 3. Antenna of *Stomatothrips brunneus* J. C. Cwfd., female. Fig. 4. Antenna of *Stomatothrips brunneus* J. C. Cwfd., male. Fig. 5. Antenna of *Stomatothrips septenarius* Hood, female. Fig. 6. Forewing of *Stomatothrips septenarius* Hood. Fig. 7. Forewing of *Stomatothrips flavus* Hood, female. Fig. 8. Forewing of *Stomatothrips brunneus* J. C. Cwfd., female. Fig. 9. Body outline of *Stomatothrips flavus* Hood, female. Fig. 10. Terminal abdominal segments of *Stomatothrips flavus* Hood, male (dorsal). Fig. 11. Enlarged section of sensory area (not to scale). Scale: Figs. 1, 2, 3, 4, 5, line equals 0.01 mm.; Figs. 6, 7, 8, 9, line equals 0.10 mm.; Fig. 10 line equals 0.10 mm.

In comparison with other related genera, *Stomatothrips* is rather rare in collections. On the other hand, the distribution of the species in North America is much greater than *Ankothrips*, *Orothrips*, or *Erythrothrips*. At present, *Stomatothrips flavus* is known to occur from Arizona to Georgia and from North Dakota to Mexico, *brunneus* is restricted to the southwest, and *atratus* is known only from Texas. The remaining species are tropical.

Practically nothing is known of the biology of this group but they are undoubtedly predaceous. The wide variety of hosts from which they have been collected such as cotton, peach, grass, alfalfa, grape, yucca, and so on, indicates strongly this type of habit. The collection of several specimens from peach orchard soil (Crawford, 1940) by federal entomologists clearly indicates that pupation takes place in the ground. To our knowledge, larvae of *Stomatothrips* have not been identified. Based on our studies of related genera, we can conclude that the mature larva drops to the soil (or cover) beneath the hosts and forms a loose cocoon. Like *Franklinothrips*, this group of thrips is not sufficiently abundant in North America to be of any value in controlling injurious insects and mites.

STOMATOTHRIPS HOOD, 1912

Head about as wide as long, not noticeably projected beyond eyes, broadly attached to thorax as in *Franklinothrips*. Compound eyes not produced or only slightly prolonged ventrally. Antennae nine-segmented, the distal segment very small and closely attached to the eighth, long and slender and somewhat differently proportioned in the sexes, similar in general appearance to *Erythrothrips* and not as thread-like as in *Franklinothrips*. Sensory areas on the antennal segments as follows: On III, narrow, linear and ventral, with central row of dots; on IV, narrow, ventral and hooked at tip on underside, curving inward (as in *Desmothrips*), also with central row of dots; on V and VI, cuneiform; on VII, variable, linear to oval. Maxillary palpi geniculate, 7 to 8 segmented, sometimes fused near tip. Labial palpi five-segmented. Pronotum without strong spines. Fore tarsus with hook-like appendage. Wings distinctly expanded at tip and narrowed in second eighth (as in *Allelothrips* Bagnall) with two white cross bands, one sub-apical and the other in basal fourth. Two longitudinal veins in fore wing, with the usual cross-veins. Abdomen broadly expanded at segments IV to VII, with a narrow "waist" and sharply pointed at tip, as in *Franklinothrips*. Ovipositor upturned. Male small and slender without genital claspers, as in *Erythrothrips*. First abdominal segment elongate and divided into thirds by longitudinal ridges as in related genera. Antennal segments differently proportioned, segment VII usually longer than in female.

Genotype—*Stomatothrips flavus* Hood, 1912. By original designation. See also Priesner, 1949, p. 149.

STOMATOTHRIPS ANGUSTIPENNIS HOOD, 1949

1949. HOOD, J. D. Rev. de Ent. 20(1-3):12-14, fig. 9.

This species is known only from the original Brazilian material. It should be noted that this species has a micropterous form. The 7-segmented maxillary palps, the longer head, and the light-colored antennal segment IV separate it from related species.

STOMATOTHRIPS ATRATUS HOOD, 1939

1939. HOOD, J. D. Rev. de Ent. 10(3):550-551.

1949. BAILEY, S. F. Fla. Ent. 32(1):24.

This species was described from two females taken on a host thought to be *Lycium berlandieri* at San Antonio, Texas, March 22, 1939. There have been no published records of it since.

Male. Body dark brown. Legs concolorous with body. Wings marked as in original description of female, i.e., no pale spot in center of dark band. Antennal segments I and II dark brown; III yellowish brown, darker at tip, remaining segments dark brown, IV with light ring just above base. Sensory areas on antennae normal. Genitalia without claspers. Maxillary palpi seven-segmented, the terminal segments considerably shortened and indicating fusion. Setae on dorsum of head and pronotum small, scattered, and similar in size.

Described from one specimen from Winter Haven, Texas, taken by K. Sakimura (Collection 3507), October 3, 1948, ex. *Lycium berlandieri*. The slide is in the writer's collection.

STOMATOTHRIPS BRUNNEUS J. C. CRAWFORD, 1940

1940. CRAWFORD, J. C. Proc. Ent. Soc. Wash. 42(2):45.

1948. BAILEY, S. F. Fla. Ent. 31(2): 39, 41.

Female. Dark brown, often with red sub-hypodermal pigment rarely extending into legs, wings and antennae. Abdomen with segment II and X light brown. Legs dark brown with middle and hind femur usually lighter than tibiae.

Head wider than long, faintly striated, cheeks not strongly arched. Eyes not protruding and only slightly prolonged ventrally, post-ocular setae scattered, not strong, the largest being directly behind the posterior ocellus (and these are variable). Maxillary palpi 8-segmented. Antennal segments I and II brown, II yellowish brown distally, III yellow, usually with a circle of brown at tip, IV brown at tip with various degrees of shading to yellow base, V-IX dark brown. Sensory areas: on III linear, slightly curved at tip and extending over half the length of segment, IV recurved at tip, partly encircling the segment and extending two-thirds its length, on V and VI cuneiform and near distal end, on VII and VIII small and oval (see fig. 3).

Forewing very similar to that of *flavus* but usually slightly larger (see fig. 8). Fore vein with 18 to 25 setae, hind vein with 14 to 20, cross bands as in *flavus*. Hind wing faintly pigmented with grey in a similar pattern to that of forewing.

Legs brown, in dark specimens uniformly so but in teneral specimens with the femora mottled or yellow. The usual claw present on fore tarsi. Scattered small setae on entire surface of pronotum, two slightly stronger bristles near center of posterior margin. Shape of body as in fig. 9.

Measurements (in mm.): Head, length, .162, width, .216; antennal segments, I, .038; II, .051; III, .124; IV, .076; V, .060; VI, .048; VII, .048; VIII, .022; IX, .012. Pronotum: length, .202; width, .229. Forewing: length, .91; width at narrowest portion, .094, at widest portion .22 or 2.3 times width at narrowest point. Total body length, 1.97 (expanded).

Redescribed from a series of specimens from Texas, Iowa, Arizona, New Mexico, and Oklahoma. The above description takes into account color variations and the measurements are average figures for 25 specimens. Some individual specimens have very short antennae but vary in no other way.

Male. Color as in female. Abdomen slender and having the general appearance of an *Erythrothrips*. Genitalia without claspers as in *flavus* (see fig. 10). Antennae long and slender, bicolorous, segments I and II yellowish brown, II yellow at tip, III yellowish brown, IV-IX brown. Sensory areas as in *flavus* (see fig. 4). Wings smaller and more slender.

Measurements (in mm.): Antennal segments, length, I, .032; II, .044; III, .115; IV, .089; V, .060; VI, .048; VII, .041; VIII, .016; IX, .011. Head: length, .155. Pronotum: length, .162. Forewing: length, .75; width at narrowest portion, .067; at widest portion, .112. Total body length, 1.5.

The male is described from a specimen with the following data: "Cover sweeping. Phoenix, Ariz., July 9, 1937. L. D. Christenson. C-25-58. Lot 37.25836." The slide is the property of the Federal Bureau of Entomology and Plant Quarantine, Washington, D.C.

This species appears to be more variable than any other studied. In the future *brunneus* will probably be found to be more than one species.

STOMATOTHRIPS FLAVUS HOOD, 1912

1912. HOOD, J. D. Proc. Biol. Soc. Wash. 25:63-66, fig. 1.

1923. WATSON, J. R. Univ. Fla. Agr. Exp. Sta. Bull. 168:8, 25.

1949. BAILEY, S. F. Fla. Ent. 32(1):24.

The genotype may have been based upon what we now consider two species, *flavus* and *brunneus*. Of the five paratypes we have examined, two (one male and one female) have the shorter antennae, stronger post-ocellar setae, and somewhat larger wings which characterize *brunneus*. An examination of the holotype will be necessary to clearly establish the possible synonymy of *brunneus* and, if such is the case, a new name for the form with the long antennae which we have previously known as typical "*flavus*" will be necessary. Eventually, when a large series of specimens has been accumu-

lated throughout its range, a new species, intermediate between *flavus* and *brunneus*, may be justified.

It is desirable to supplement the original description with several characters which are now necessary to be known in order to key out the species.

The setae on the dorsum of the head are all about the same size, scattered and without a definite pattern. Eyes not prominent but slightly prolonged posteriorly. Sensory area on antennal segment III linear, variable in length, ventral, usually extending more than half the length of segment, expanded at tip and with minute, irregular, clear, circular areas in central portion (see figs. 1 and 11); a similar area on segment IV but curved at tip, and extending about three-fourths the length of the segment. One or two small, oval sensory areas on VII from which arise a cone. Segment IV yellow, usually with a very narrow brown ring at tip. Ovipositor upcurved. Male with dark greyish brown antenna (fig. 2) with the segments differently proportioned. Genitalia similar to *Erythrothrips*, without claspers (see fig. 10).

A micropterous form is now known from Illinois. It varies from the typical individuals only in the size of the wings which are 0.67–0.74 mm. long.

STOMATOTHRIPS SEPTENARIUS HOOD, 1925

1925. HOOD, J. D. Psyche 32(1):48-49.

1949. BAILEY, S. F. Fla. Ent. 32(1):24.

The single female specimen kindly made available by Dr. C. B. Williams, the collector, has the following data appended: "Trinidad, B.W.I., March 29, 1915. St. Joseph. No. 621. Swept from grass." The forewing and antenna have been illustrated for convenience (figs. 5 and 6) and the original description supplemented as follows:

Head brown, anterior portion yellowish brown. Ocelli with crimson crescents of pigment normal. Eyes not prominent, very slightly prolonged ventrally. Inter-ocular and post-ocular setae very moderate and without a characteristic pattern. Cheeks slightly swollen, with very faint reticulation. Maxillary palpi 7-segmented. Antennal segments I and II yellowish brown, III pale yellow to white with dark brown ring of pigment at tip, IV-IX dark brown, IV lighter in basal portion. Sensory areas as in *flavus* with that on segment IV strongly curved at tip (see fig. 5).

Forewing smoky brown with two white cross-bands, one in basal fourth and one in distal fourth, with an indistinct lighter area near center. The ring

vein is pigmented throughout its distal portion (see fig. 6). Fore veins of forewing with 19 and 22 setae, hind veins with 13 setae each. Hind wing typical of the genus.

Legs brown, femora lighter than tibiae. The usual claw present on fore tarsi. Thoracic area brown with light orange tint. Abdomen brown with segments II and III lighter. Shape of body as in fig. 9. Setae on pronotum small, uniform in size and more or less uniformly placed over entire surface. Sub-hypodermal pigment in body orange rather than red.

Measurements (in mm.): Antennal segments, length: I, .028; II, .049; III, .128; IV, .102; V, .038; VI, .070; VII, .057; VIII, .019; IX, .012. Head, length, .147; width, .176. Pronotum, length, .169; width, .217. Forewing, length, .837; width at narrowest portion, .074, at widest portion, .121, or 1.6 times as wide as at narrowest point. Total body length, 1.63.

STOMATOTHRIPS ROTUNDUS HOOD, 1949

1949. Hood, J. D. Rev. de Ent. 20(1-3):10-12, figs. 7, 8.

This South American species is known only from the original collection. It belongs in that segment of the genus having 7-segmented maxillary palps. From its relatives it is distinguished by the dark-colored antennal segment IV and the broader head.

It should be noted that the two species of *Stomatothrips* described from South America have been collected from *Panicum* as have also *flavus* and *brunneus* in Texas.

A KEY TO STOMATOTHRIPS SPECIES

1. Maxillary palpi 8-segmented 2
 Maxillary palpi 7-segmented 3
2. Antennal segment IV long and slender (.131-.147 mm. in female), usually pale yellow with brown ring at tip. Segment III yellow. Antennae of male very long and slender, all segments smoky brown. General body color yellow to light brown. (North America).....*flavus* Hood, 1912
 Antennal segment IV much shorter (.080-.092 in female), shaded with dark grey or brown at tip usually with more pigmentation than narrow ring at tip. Antennae of male bicolorous, segments II and III light yellowish brown, I darker, IV-IX dark brown and much shorter. General color brown to dark brown with crimson sub-hypodermal pigment.....
 (North America)*brunneus* J. C. Crawford, 1940
3. Antennal segment IV white with black line around tip. Male unknown. (South America)*angustipennis* Hood, 1949
 Antennal segment IV blackish brown.....4
4. Forewing narrow and not strongly expanded in distal third (fig. 6). Ring vein pigmented along entire costal margin distally. Anterior longitudinal vein of forewing with 19-22 setae. Male unknown. (Central America)
 *septenarius* Hood, 1925

Forewing expanded distally, greatest width 1.6 to 1.7 times the least width 5

5. Intermediate dark-colored portion of forewing without paler areas (as in figs. 6, 7, and 8). Antennal segments V and VI each with cuneiform sensory area; VII .041 mm. in length. (North America).....

.....*atratus*, Hood, 1939
Intermediate dark-colored portion of forewing paler in basal third.

Antennal segments V and VI each with a linear sensory area; VII .059 mm. in length. (South America).....*rotundus* Hood, 1929

CATALOG OF THE SPECIES OF STOMATOTHRIPS WITH NEW DISTRIBUTIONAL RECORDS

1. *angustipennis* Hood, 1949. South America: Brazil. Nova Teutonia, Santa Catharina, Jacarepagua, D. F., Campo Grande, R. J. Taken on grasses, *Panicum* sp., and dead branch. January, May, and June. Females only; both macropterous and micropterous.
2. *atratus* Hood, 1939. North America: San Antonio, Texas. *Lycium berlandieri*. March. Females only originally. New record: one male, October 3, 1948, at Winter Haven, Texas, ex *Lycium berlandieri* by K. Sakimura.
3. *brunneus* J. C. Crawford, 1940. North America: Lafayette County, Arkansas. Unique female "in peach orchard soil." October. New records: Monterey, Mexico, July 5, 1908. C. A. Hart. In sweeping from grass, etc. Intercepted in quarantine at El Paso, Texas. Other Texas records are from Bangs, Denison, Crystal City, Waco, and Winter Haven. Nogales, Phoenix, Patagonia, Sonoita and Sedona, Arizona. Mesilla, New Mexico. Calera, Oklahoma. Sioux City, Iowa. New hosts are: alfalfa, Bermuda grass, clover, cover crops, Johnson grass, grass, lettuce, *Panicum obtusum*, peach, yucca, and in soil. Collections have been from May through October.
4. *flavus* Hood, 1912. Genotype. North America: Monterey, Matamoras, and Tlahuailio, Mexico. Brownsville, Texas. Dubois and Odin, Illinois. Common on cotton, grass, and weeds. June to September. Both sexes. New records: Elkpoint, South Dakota. Nashville, Tennessee. Gorham, Eldred, Eichorn, Hoopeston and New Canton, Illinois. Baton Rouge, Louisiana. Toquerville and Brigham, Utah. Clifton, Glendale, Phoenix, and Tucson, Arizona. Imperial County, California. Rogers, Arkansas. Lawrence, Kansas. Texas localities of Temple, Crystal City, Carrizo Springs, Brownsville, El Paso (in quarantine station), Waco, Bexar, and Caldwell Counties. Four-mile Run, Virginia. Putman County, Georgia. The list of hosts now include alfalfa, *Andropogon*, clover, cotton, corn, *Malva rotundifolia*, grass, grape, *Panicum obtusum*, partridge pea, peach, turnip, weeds, and in soil. Collection dates extend from April through November. The micropterous form is known from Illinois.
5. *rotundus* Hood, 1949. South America: Brazil. Nova Teutonia, Santa Catharina. *Panicum* sp. January. Both sexes.

6. *septenarius* Hood, 1925. Central America: Trinidad and St. Thomas (B.W.I.). Grass sweeping. Females only. March 29, 1915. New record: La Ceiba, Honduras. July 15, 1949. Flying. E. C. Becker, Coll. This specimen is in the collection of the Illinois Natural History Survey.

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RECORD OF STENOMORPHA CONSOBRINA FROM
WASHINGTON AND OREGON
(Coleoptera: Tenebrionidae)

Twenty-seven species of this tenebrionid beetle were given to me by my friend Mr. Samuel Sargent, a geologist employed by the U.S. Engineers at The Dalles, Oregon. They were collected about a mile north of The Dalles, across the Columbia River in the state of Washington, December 15 to 21, 1951. This is a new record of this species for Washington. He also tells me that the beetles are quite common periodically in the area of The Dalles, Oregon, where they are usually found under stones; this is their first recorded occurrence in Oregon.—BORYS MALKIN, *University of Washington, Seattle.*

NOTES ON TELEGEUSIS AND SOME RELATIVES

(Coleoptera, Lymexylidae)¹H. S. BARBER²

*Bureau of Entomology and Plant Quarantine, Agricultural Research
Administration, U. S. Department of Agriculture*

Two small, slender, pale beetles having very short elytra and long sensory extensions on the labial and maxillary palpi came to our old oil lantern in Castle Creek Canyon near Hot Springs (40 miles northwest of Phoenix), Arizona, in late June, 1901, and the enigma of their significance as then explained by E. A. Schwarz was very impressive. He and H. G. Hubbard had taken another species of this genus near Tucson and at Fort Grant three years previously, and only Horn's record of the single specimen from the tip of the Lower California peninsula was then known. Later a specimen in the Horn collection in Philadelphia was mistakenly believed to be the type, but it and our samples were extremely unlike the figure published by Horn in 1895 (Proc. California Acad. Sci. vol. 5, pl. 20, fig. 1). New illustrations and notes were made, but it became clear that until more adequate samples and data were available the naming of "new species" would merely confuse the involved issues.

Horn had placed *Telegeusis* in the Drilidae, in which family it was catalogued by Olivier, 1910 (in Junk, Coleopterorum Catalogus, part 10, p. 9). My suspicion that *Telegeusis* is a very close relative of *Atractocerus* in the Lymexylidae, as stated in 1913 while considering affinities of *Micromalthus* (Proc. Ent. Soc. Washington vol. 15, p. 37), was supported by the late Fred Muir (in litt.) in time to record his finding in a footnote. Leng, 1920 (Cat. Coleop. Amer. north of Mex. pp. 31, 152), proposed the family name Telegeusidae, and later Leng and Mutchler, 1927 (Suppl. Cat. Coleop. north of Mex. p. 28), wrongly removed *Atractocerus gracilicornis* Schenkling, 1914, from Lymexylidae and placed it in Telegeusidae. Martin, 1932 (Pan-Pacific Ent., vol. 8, p. 91), gave the name *Telegeusis nubifer* to two specimens from southern Arizona, as distinct from *T. debilis* Horn; the types of both are preserved in the California Academy of Sciences. Schenkling, 1934 (in Junk,

¹Leng's use of Lymexylidae is correct and reappears in the catalogue by Winkler 1925, but Lymexylonidae is still used in foreign papers. Dr. Roland Brown tells me the Greek word xylon is neuter and calls for the shorter spelling under the Rules.

²Mr. Barber died on June 1, 1950.

Coleop. Cat., part 133), adopted *Telegeusidae* from Leng, including only the two species but did not refer to Olivier, 1910, nor to Barber, 1913.

Much additional material was accumulated by various collectors, but the uncertainties remained very discouraging. The present note results from the kindness of Dr. E. C. Van Dyke in placing the type specimens of both named species of *Telegeusis* before me and, after 47 years of doubt, it was a great satisfaction to learn how closely Horn's type specimen agrees with the figure he had published.

Most of the facts of life of this genus are still unknown, and until a better method for preparing such delicate forms can be applied to new samples little more than taxonomic guessing can be expected. Nearly forty males came to the lantern on June 17, 1949, in Baboquivari Cañon (50 miles southwest of Tucson) Arizona, during a short period before a windstorm, and were rapidly collected in an aspirator by Dr. Floyd G. Werner. They were killed in ethyl acetate vapor and preserved in 70% alcohol. Much of the shrinkage and collapse of their structure so objectionable in ordinary specimens was thus prevented. After they had been dehydrated in absolute alcohol, cleared in xylene, dried, and mounted, very superior specimens were available, but, if a method of distending such specimens can be applied before they are fixed in alcohol, still better samples might be obtained.

This and other series preserved by various collectors indicate the abundance of these beetles at their time of flight. But as yet no association of sexes, no breeding place, no larvae, and no biology are known. No female has been recognized, and all specimens in collections are probably males. The sex of the type of *T. debilis*, which Horn believed to be a female, could not be positively ascertained without relaxing it, but the visible terminal segments seemed identical in shape with specimens known to be males.

The following hypothesis may stimulate better investigation.

The very few and too little-known species comprising the primitive family Lymexylidae of wood borers have survived as "living fossils," but have undergone very divergent structural modification adaptive to their extremely different habitats and habits both in their adult and larval forms. The feeble soft-bodied ship-timber beetle *Lymexylon navale*, which bores in oak in northern Europe,

retains its beetle-like structure with long elytra covering transversely folding and normally veined underwings; the related genus *Atractocerus* of tropical forests, whose larva resembles that of *Lymexylon*, has reduced its elytra to vestigial appendages and has developed strong longitudinal venation without transverse folds. *Atractocerus* flies like a hawk moth, and in some species vertical and horizontal rudders have developed in the form of a large mid-ventral lamella and lateral expansions of segments 8 and 9 of the very flexible abdomen. *Telegeusis* is a dwarfed, depressed, and simplified relative of *Atractocerus* modified to its life in the Sonoran desert region. Its breeding place is probably in the roots of desert plants. Its depressed form, small size, and pale color are necessary adaptations to this habitat and enable the males to seek out their yet unknown mates which probably remain close to the roots in which they matured. These beetles are abundant from Cape San Lucas to central Arizona.

But who will dig them out, recognize their larvae in their galleries and learn if, like so many other plant borers, different species are peculiar to different host plants? For, as is repeatedly evident in our work, species (i.e., self-perpetuating populations isolated by some vital barrier from related but similarly isolated populations) may be more distinct in their hereditary chemitropic controls than in visible structural differences. As yet, we have from such populations only relatively minute samples consisting mostly of shrunk and mummied individuals without any reliable comparative vital data.

Too little is known of the aedeagal structures of the Lymexylidae, and it is unfortunate that the latest contribution (Jeannel and Paulian, 1944, Rev. Francais d'Ent., vol. II, fasc. 2, p. 77, fig. 19) illustrates what seems to be the somewhat mutilated female structures (ovipositor) of *Atractocerus brevicornis* as if they were the genitalia of the male. Figures 46 and 47 on p. 83 of this work seem also to have been drawn from the female (ovipositor) and do not represent male structures (aedeagus) of *Ripiphorus* (which they call *Myodytes subdipterus*). Sharp and Muir, 1912 (Trans. Ent. Soc. London, p. 542, pl. 66, figs. 149, 150, 150a), had already given excellent diagrams showing aedeagi of two species of *Atractocerus*, but great modification of the median and lateral lobes is evident in the few males of other species which are available in the United

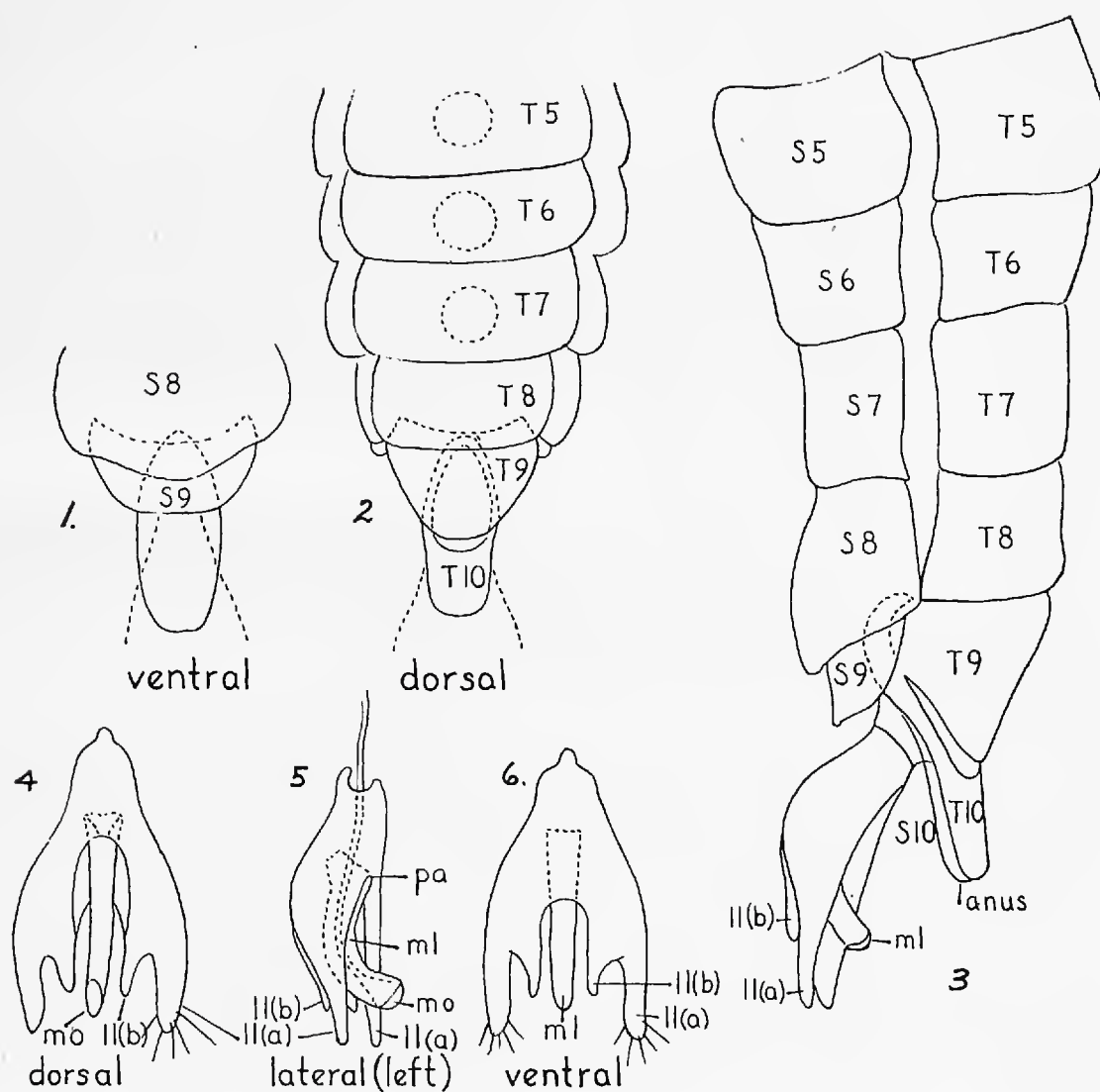
States National Museum. Drawings of the aedeagi of *Telegeusis nubifer* and of *Micromalthus debilis* made by the late F. Muir and sent to me shortly before his death are here offered (fig. 1-9). The abbreviations labeling the parts are those adopted by Sharp and Muir, 1912 (*op. cit.*, p. 481, 482) except that the letter "a" indicates the medially produced and united inner process from the bases of the lateral lobes, similarly indicated as "a" in their treatment of *Atractocerus africanus* (*op. cit.*, p. 542, and fig. 150).

The aedeagi of *T. nubifer* and *schwarzi* are similar, but different preparations appear different according to extent of shrinkage or inflation. The long dorsally concave or flattened apically-rounded lateral lobes appear to embrace the apically-pointed, basally broadly-expanded midventral lobe (indicated by *a*) which arises from the inner bases of the lateral lobes; the side margin and apex of this lobe is raised into a sclerotized carina, within which the upper surface is deeply recessed and membranous; out of this recess arises the slender strongly upturned and curved median lobe with its small subapical ventral functional orifice.

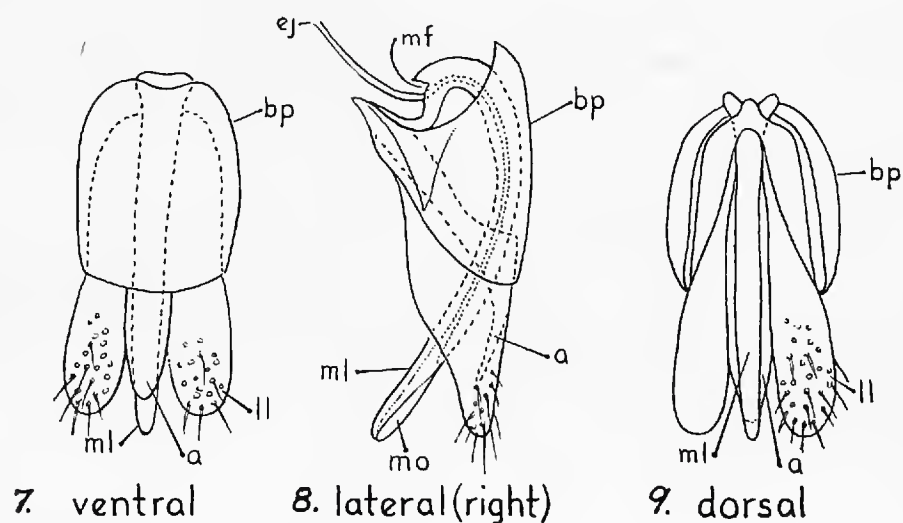
The modified alar venation of *Atractocerus* and of *Telegeusis* appear comparable and derived from the primitive venation of *Lymexylon*, the differences between the first two being such as are necessary for the swift and powerful flight of *Atractocerus* in contrast with that of the feeble Sonoran form.

It is not rare that functional sensory organs by which males are guided to their mates become highly developed and complex in larger and more active forms, as in the maxillary palpi of several genera in this group. The development of similar sensory surfaces on both the enlarged maxillary and labial palpi in *Telegeusis* should not be surprising. It should be remembered that the complex plumose sensory structures of the maxillary palpi of *Hylecoetus dermestoides* Linnaeus, in which the antennae are simple, are absent, in *H. flabellicornis* Schneider, in which similar sensory organs are developed in the antennae which have become biramose. These modifications have been shown very clearly by Germer, 1912 (*Zeitschr. f. wissenschaft. Zool.* Bd. 101, Heft 4, pp. 683-735).

Opinions on family rank have commonly been based upon structural peculiarities supposed to isolate such units from all related forms, and the peculiarities so obvious in *Telegeusis* in-



Micromalthus debilis Lec



Telegeusis nubifer Martin

Figs. 1-6, *Micromalthus debilis* Leconte. Figs. 1-3, ventral, dorsal and lateral views of part of abdomen of male. Figs. 4-6, dorsal, lateral and ventral views of aedeagus of male. Figs. 7-9, *Telegeusis nubifer* Martin, ventral, lateral and dorsal views of aedeagus of male.

duced Leng, 1920 (*op. cit.*), to propose a new family name for it although he left it doubtfully in the superfamily Lymexyloidea. The great adaptive diversity so conspicuous in the few known stages of the very dissimilar genera and species composing this group presents a problem on which opinions will probably continue to differ and will induce conflicting explanations of anatomical details. This diversity is even more complicated by recent reassignment of *Micromalthus* to the Lymexylidae, and if this be accepted the larval modification becomes much more complicated.

But I am surprised at the misinterpretation of the real structure of the leg of first stage *Micromalthus* larva (Jeannel and Paulian, 1944, *op. cit.*, p. 79, fig. 23). In this stage the long tarsus and two claws seem to have survived from the ancestors of the Coleoptera, while all other families, except carabid relatives, have simplified and more or less consolidated these primitive appendages. A distinct tarsus and one imperfectly consolidated claw seem to be present in *Hylecoetus* as well as in *Melittomma*, but in the latter the pair of enlarged spines on the tip of the tibia seem to have been mistaken for lobes of the supposedly consolidated tarsus and claw. One should consider, however, that such comparison of structures of first-stage larvae (*Micromalthus*) with those in advanced larvae of a very different genus (*Melittomma*), even if the structure were correctly understood, may not be a sound method. We know the first-stage larva of *Hylecoetus* only from the figure by Germer, 1912 (*op. cit.*, pl. 30, fig. 5), in which the leg structure is not clearly shown.

The drawing by Fulmek, 1930 (*Treubia*, vol. 12, p. 391), is not clear as to leg structure, but illustrates an apically bidentate pygidial plate (tergite 9) in the first-stage larva of *Atractocerus emarginatus* Castelnau. Embryos extracted from eggs laid by a Guatemalan *Atractocerus* show a pointed, broadly triangular pygidial plate (T 9) with long hairs arising from the margin on each side of the apex and with the margin strongly serrate towards its base, legs conventional in form with single claw. The differences between first-stage larvae and those which follow are often great, and attempts should be made to hatch eggs laid by freshly captured females of such interesting and problematical forms.

The affinities of adult *Telegeusis* and *Atractocerus* seem obvious, and similar affinities of larvae of *Atractocerus* and *Lymexylon*

suggest there is no need for a supergeneric name based on *Telegeusis*. Comparable structures in adults of *Telegeusis* and *Micromalthus* might be used to place the latter in the same family, but its highly specialized larval forms do not seem to permit such assignment, and the statement (Jeannel & Paulian, 1944, *op. cit.*, p. 79) that abdominal segment 10 is the same in larvae of *Micromalthus* and *Melittomma* seems to be not true in our samples of these forms. Relationships have been discussed with John R. Bowman, whose evidence indicates *Micromalthus* as the closest relative of *Telegeusis*. The problem cannot be solved, however, until more exact details are available for the various larval stages of the comparatively few genera of these isolated survivors from a primitive ancestral stock.

TELEGEUSIS DEBILIS Horn, 1895, Proc. Calif. Acad. Sci., ser. 2, vol. 5, p. 242, pl. 20, fig. 1; Martin, 1932, Pan-Pacific Ent. vol. 8, p. 91, genotype, monobasic.

The holotype and only known specimen of this species, labeled "Sierra San Lazaro," preserved in the California Academy of Sciences and marked as Lectotype No. 32, is in relatively good condition and agrees surprisingly well with the rather crude original illustration by Horn. It is slender, entirely pale yellow (perhaps a little faded), with head one-half longer than the pronotum which is slightly transverse, three-fifths as wide as elytra and four-fifths as wide as the distance across the eyes. The elytra are narrow, tapering and long, extending one-third of their length beyond the hind coxae; the abdomen plainly shows 9 tergites and what may be the tip of tergite 10 (anus?) projecting from beneath the narrowly rounded pygidium (T 9) as a subcylindrical slightly tapering narrow tube; 8th visible sternite (S 9) is longer than wide, transversely convex and apically rounded. The side margin of the head from the hind margin of the eye to the cervical membrane is one and one-half times the length of the eye.

Horn believed this specimen was a female. When I examined it in July, 1948, its sex was not apparent, but subsequently studied males of other species, in which the aedeagus is concealed within segment nine, display apical segments in agreement with notes I made from this type.

TELEGEUSIS NUBIFER Martin, 1932, Pan-Pacific Ent., vol. 8, p. 91.

I apply this name to the numerous specimens from Arizona and Lower California which show more or less infuscation, and short elytra extending to above the apex of the hind coxae. It is not now practicable to attempt division of this assemblage. Much better evidence than is now available should be obtained.

The holotype (No. 2467, California Academy of Sciences) is labeled "San Pedro Riv. Fairbanks, Ariz., Sept. 6, 1927, J. A. Kusche."

Telegeusis schwarzi Barber, new species

Entirely pale yellow except eyes and palpi, elytral apices and posterior margin of pronotum whitish; elytra only about one-seventh longer than their combined width across humeri, their apices reaching only to lateral base of hind coxae and more broadly rounded than in *T. nubifer*. Length 5 to 8 mm., dry. The caustic treated specimen mounted in balsam distended to 10 mm.

Holotype and three paratypes: U. S. National Museum Cat. No. 59816. Holotype (slide) and one paratype: Hot Springs, Arizona, 26 and 27 June, 1901, collected by E. A. Schwarz in memory of whom the species is named. Three paratypes: Globe, Arizona, July 3, 1949, F. G. Werner, one of them returned to Werner.

Very similar to *T. nubifer* but paler, slightly broader, the antennal joints slightly stouter, the sides of the pronotum more deeply emarginate at middle, the gula narrower.

The simple differences suggested in the following key do not apply entirely to certain males which are tentatively regarded as variants of *T. nubifer*. The very wide area occupied by what seems to be this most abundantly represented "species" may be misleading owing to the present inability to distinguish actual species among the shrunken and distorted males. If the as yet unknown females are sedentary in their habits or are, by inheritance, attracted to different kinds of host plants for oviposition, we will need a different taxonomic treatment of species.

KEY TO THE RECOGNIZED SPECIES OF TELEGEUSIS

1. Elytra tapering, narrow, subacute and long, extending one-third their length beyond the hind coxae; head much longer than the pronotum. Sierra San Lazaro, Baja California (? 10 mi. NW. of San Jose del Cabo)*T. debilis* Horn
Elytra short, arcuately truncate, not passing apex of hind coxae; head but little longer than pronotum.....2
2. Elytra reaching apex of hind coxae or about a third longer than their width across humeri, their apices infusate. Arizona and Baja California*T. nubifer* Martin
Elytra shorter, their apices reaching only to base of hind coxae and not infusate, the width across humeri nearly equal to elytral length. Central Arizona.....*T. schwarzi* Barber

DESCRIPTION OF A NEW ARIZONA THAUMAGLOSSA

(Coleoptera: Dermestidae)

R. S. BEAL, JR.

Denver, Colorado

In the course of a study of the Dermestidae the writer found five specimens of a remarkably distinct species of *Thaumaglossa* Redtenbacher, which species is named and described as follows:

Thaumaglossa libochoras Beal, new species

Adult male: Strongly convex, ovate, widest at humeri, rust-red on all surfaces; vestiture in length about three-fifths as long as scutellum, golden-brown, evenly distributed, moderately fine and moderately dense, suberect on dorsal surfaces, subrecumbent on ventral surfaces. *Head* in width (measured across eyes) closely approximating length of pronotum; punctures of front and clypeus round, shallow, about two and one-half times as coarse as facets of eye, nearly contiguous, becoming somewhat smaller and less dense on vertex; width between fossae for insertion of antennae closely equal to distance from distal margin of clypeus to basal margin of fossae; antennae with scape and funicle sparsely clothed with fine setae, eleventh segment densely clothed with fine, erect puberulence about equal in length to sixth antennal segment, configuration of antenna as illustrated, eleventh segment in repose extending over lateral lobe of prosternum as far as middle of procoxa. *Pronotum* with punctures of disc simple, equal in coarseness to facets of eye, separated by one to three diameters, becoming larger and nearly contiguous toward sides, surface between smooth and shining; ratio of length to width 1:2.1. *Elytra* with punctures of disc twice as coarse as facets of eye, separated by about one diameter with margin of each very slightly raised above surrounding surface, surface between feebly rugose and shining; ratio of pronotal width to elytral width at humeri 1:1.1. *Prosternum* deeply, coarsely, and confluent punctate on disc without impunctate median line, becoming granulate-punctate on sides. Antennal fossae occupying entire hypomerion; antero-lateral and posterior margins knifelike, evenly produced, and extending entire length of fossa; fossae completely open (without margins) medially; floor of cavity glabrous and shining, transversely strigose except for short longitudinal strigose lines along posterior wall. Mesosternal disc with punctation about as prosternal disc. *Length* (of pronotum and elytra): 3.1 mm.; *width* (across humeri): 2.1 mm.

Adult female: Color of head and pronotum piceous-black, elytra piceous-black except for rufo-piceous apical margins, thorax piceous, abdomen, antennae, and legs reddish-brown. Eleventh segment of antenna small, scarcely wider than tenth and about twice as long as length of ninth and tenth segments combined. Hypomerion margined as in male, but without fossa for reception of antenna, surface flat and coarsely punctate except for small impunctate depression at middle of medial margin, this depression not at all margined. *Length* (of pronotum and elytra): 3.8 mm.; *width* (across humeri): 2.6 mm.

Holotype: Male (in collection of Ohio State University) collect-

ed at PALMERLEE, ARIZONA, July 14, 19-?, by H. A. Wenzel; *allotype* female, same, July 11; female paratype, same, July 16; male paratype, same, July 10 (allotype and female paratype in collection of Ohio State University, male paratype in author's collection); one female paratype, Santa Rita Mts., Arizona, Hubbard and Schwarz (in collection of U. S. National Museum).

While clearly distinct from all known members of the genus, *libochoras* belongs to *Thaumaglossa* as now defined, having the strongly convex, ovate shape, the two, small, short, diagonal, impunctate areas on either side of the basal lobe of the pronotum, the completely divided mesosternal disc, and the oblique diagonal striae of the first abdominal segment, the male having the one extremely large, subsecuriform, terminal, antennal segment, and the female having the flat but acutely margined hypomeron. It is undoubtedly most closely related to the other nearctic species, *americana* (Jayne), from which it differs most noticeably in the shape of the male terminal antennal segment, in the relatively denser punctation of the pronotum, and in its larger size. In specimens of *americana* measured by the writer the males vary in length from 1.9 mm. to 2.6 mm., the females from 2.2 mm. to 2.7 mm. While the color of the specimens above is uniform, color here as a character is probably neither reliable nor constant, the color of *americana* varying over a wide range.

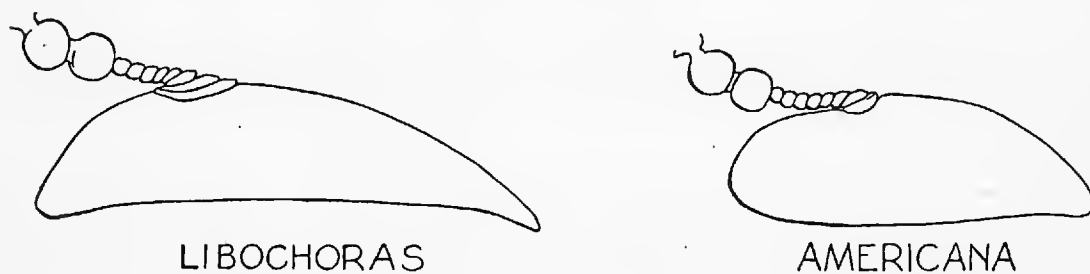


Fig. 1. Antennae of males of *Thaumaglossa*.

From the oriental *rufocapillata* Redtenbacher, type of the genus, both *libochoras* and *americana* differ markedly, the first species having at the antero-median angle of the hypomeron of the female a round, deep, and strongly margined fossa into which the antennal club exactly fits, and having an appreciably narrower separation between the fossae for the insertion of the antennae on the head. These characters hold likewise for two other oriental species seen by the writer, *nigricans* MacLeay and *hilleri* Reitter, and in any future revision of the genus should be carefully considered as indicating the divergence of our American species.

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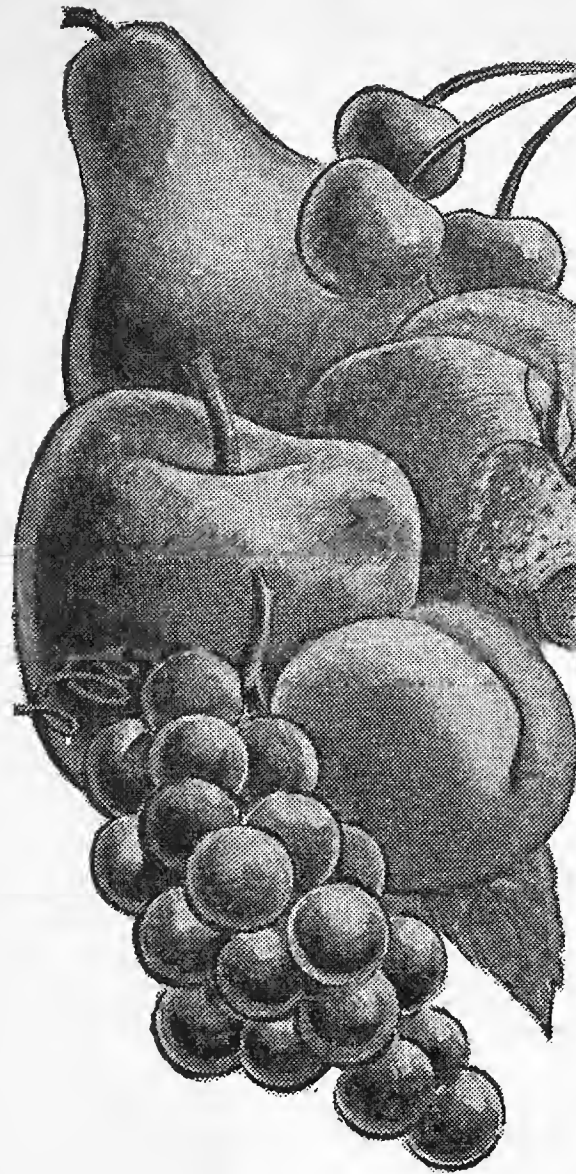
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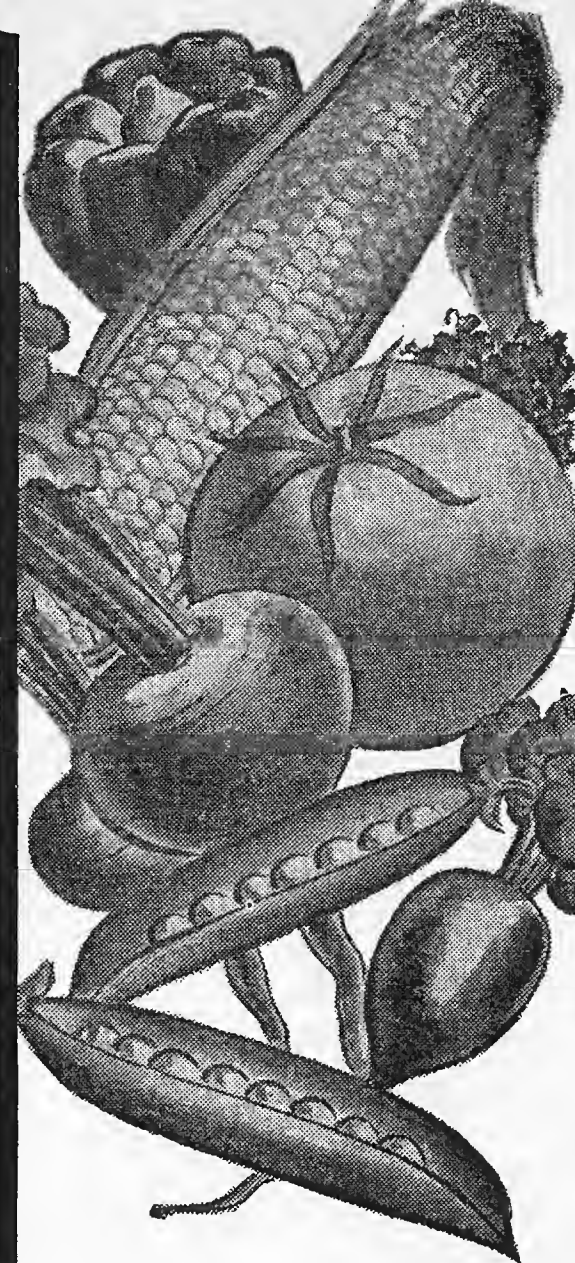
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The Pan-Pacific Entomologist

VOL. XXVIII, No. 4

October, 1952

ON THE IDENTITY OF ADLERZIA FOREL

(Hymenoptera: Formicidae)

WILLIAM L. BROWN, JR.

Museum of Comparative Zoology, Cambridge, Mass.

It would be difficult to find a subfamily of insects in which generic placement of a given specimen is as difficult as in the Myrmicinae. The standard keys of Emery and Wheeler, both published in 1922, are virtually useless in determining many genera even when in the hands of a myrmecologist with long experience. This unhappy situation reflects the chaotic state of myrmicine classification even as it stood in 1922. In that year, so many genera were wrongly defined, synonymous with others, or hopelessly heterogeneous in composition that one is astonished that the aforementioned authors had the courage to attempt keys to the world genera without first radically altering the classification. Of course, it must be said that such alteration might well consume a lifetime without particularly satisfactory results achieved in the end, and evidently the opinion then was that any key, however imperfect, was better than none. After a quarter century of description from various quarters, one may well doubt the wisdom of this opinion.

Authors since 1922 have been all too content to accept the keys, which are similar and therefore seem to support each other, as practically the only basis for generic identification. In this way, a great crop of generic synonyms has arisen during the last 25 years or so, and, what is worse, very many species have been steered through the dichotomies, missed a turn, and ended as new species in the wrong genus. The phylogeny and limits of the genera have now become so obscure that the most accomplished myrmecographer finds many generic assignments impossible or very highly uncertain.

In the earlier days, up to about 1900, it was possible for a specialist to have a fair idea of the species of the entire family and their proper generic assignments. However, the earlier workers have sown the seeds of the chaos now prevailing, for, knowing the species and genera by habitus more than by the characters they themselves had used in definition, they too often added species

without reference to the crucial characters used to delimit the genera. Most of the work was hasty in the extreme, with species thrown chock-a-block into the handiest receptacle or else arbitrarily made the type of a new genus or subgenus.

The subgenus particularly has been a refuge for the uncertain specialist confronted with inadequate material, and the myrmecological world is only now awakening to the fact that most of the subgenera are really either indefensible as such or else are good genera. In the latter category belong many familiar names among ants, formerly placed as subgenera in large genera like *Atta*, *Dorylus*, *Eciton*, *Dolichoderus*, *Polyrhachis*, *Lasius*, *Strumigenys*, *Solenopsis*, *Monomorium* and many others. The subgenus will continue to have its function for a long while yet, but the time has come to embrace and expand the critical study of subgenera begun by Borgmeier, Creighton, and others.

As a small contribution to the tremendous job which lies before us, of unscrambling the genera of the Myrmicinae, and as a miniature illustration of the self-propagating confusion of ant taxonomy as it is today, I should like to bring to the reader's attention the case of the ant going under the name *Monomorium* (*Adlerzia*) *froggatti* Forel.

Forel proposed the new subgenus *Adlerzia* and assigned it to *Monomorium* on the basis of a single small worker ant (*froggatti*) described as new at the same time in Rev. Suisse Zool., X, pp. 445-447 (1902). There it has remained buried without again being reported from its homeland in southeastern Australia.

In 1950, while passing through Sydney on my way north to Queensland, I spent a day collecting in the woods along the golf links at Pymble, an outer suburb of Sydney I had heard of through Father McAreavey of Melbourne. Among other ants taken was one series, found in a nest of *Camponotus consobrinus* (Erichson) under a large stone, of small tawny ants with highly dimorphic workers. These ants seen in the field fitted my rather sketchy idea of *Machomyrma* Forel as remembered from the literature and specimens in the Wheeler Collection casually examined in past years. I then put the specimens in alcohol and forgot them.

Upon my return home, I mounted these and several hundred other specimens obtained during my trip, and during the process of mounting, one of the minor workers of my "*Machomyrma*" somehow got placed on a point by itself, without an accompanying

soldier. When the remainder of the specimens had been mounted, workers and soldiers to each pin, I began the rough sorting of my collections to genera. As is usual with dimorphic myrmicines, I sorted the species falling into this category by examining the large-headed soldiers, and did not pay much attention to minor workers. Soon, however, I was confronted by my accidentally-segregated minor worker. The ant was not at all familiar to me. Reaching for Wheeler's key to the genera (*loc. cit.*), I then spent an hour or so running out to blind ends in the dichotomies and finally came uneasily to rest with my specimen in *Monomorium* subgenus *Adlerzia*.

Reference to the Genera Insectorum (Emery, *op. cit.*, p. 182) convinced me that I was in the correct genus, and I labelled the specimen accordingly. Later on the same date, I chanced to be verifying my determination of the "*Machomyrma*" soldiers with accompanying workers, and happened to look more closely at the latter. To my astonishment, I found them identical with the specimen just placed in *Adlerzia*, and this was confirmed by careful comparison. Investigation proved that all had come from the same nest series, and there could be no doubt that the workers and soldiers were different castes of the same species.

My first thought was that *Adlerzia* might have to be synonymized under *Machomyrma* Forel, for the soldiers keyed to this genus in both Wheeler's and Emery's tables. However, I checked with Dr. Charles Ferrière, of the Museum d'Histoire Naturelle, Geneva, who kindly sent camera lucida sketches and a brief characterization of the unique type of *M. (Adlerzia) froggatti*; these proved beyond a reasonable doubt that my identification of the worker had been correct.

Upon my request, Dr. Ferrière and Dr. M. R. Smith both graciously sent information concerning the two known species of *Machomyrma* Forel, as the original descriptions are not presently available to me. Although a definite conclusion is not safely reached until the types of the genotype, *Machomyrma dispar* Forel, and the additional species, *M. silvestrii* Emery, are directly studied, the indications are that the two *Machomyrma* species are not congeneric. The *M. silvestrii* characterization and figures seem to place this ant solidly in *Adlerzia* with *A. froggatti*, and it is quite possible that the two are synonymous.

One fact is clear: *Adlerzia* has no connection with *Monomo-*

rium. Rather, it seems to go into the tribe Pheidolini, and I here place it provisionally as a distinct genus. The new arrangement may be schematized as follows:

MACHOMYRMA Forel

Genotype: *Liomyrmex* (*Machomyrma*) *dispar* Forel, 1895, Monobasic.

ADLERZIA Forel (NEW STATUS; TRIBAL TRANSFER)

Genotype: *Monomorium* (*Adlerzia*) *froggatti* Forel, 1902, Monobasic.

Additional species: *Adlerzia silvestrii* (Emery), 1914.

For full references and generic characteristics, see Emery, 1922, *Genera Insectorum*, Fascicule 174, pp. 76-77 (*Machomyrma*) and pp. 168, 182 (*Adlerzia*).

I have dwelt at some length on this small taxonomic puzzle because it points up so starkly the deficiencies in the keys and in the basic classification of the ants. It is far from being an isolated example; many tangles of much greater scope and difficulty exist, becoming ever aggravated by the addition of new species year by year.

In our present-day studies of the group, there is far too much isolated description of one or a few species or subspecies scattered through many genera of ants, and far too little work of a broad revisionary nature. Creighton, Borgmeier and a few others have shown the way out of the tangle, but the majority of myrmecologists have been slow to follow. Our first and most urgent task is the reduction of the synonymy at the species- and subspecies-levels, for this synonymy has virtually stifled intelligent revision of the larger and more difficult groups under the sheer weight of numbers of presently-unchallenged and insufficiently identified names. Probably as much as 25 to 50 per cent of the names in some genera are unrecognized synonyms; this percentage, when applied to a genus like *Camponotus*, with more than 1,000 current names, is enough to discourage any reviser from taking a world approach. I find it a good rule to establish at least one clearcut synonymy for each new name I propose. Unfortunately, the establishment of one certain synonym almost invariably occupies far more time than did the original description of the synonym. New synonymy should be clearly labelled as such and provided with the original references, so that cataloguers can easily detect and disseminate it as they would newly-described species. A system which makes new synonymy bear a greater burden of proof and investigative effort than

does description of novelties is bound to perish under the weight of its own accretion. It is small comfort to this myrmecologist to realize that 1950 (with the publication of Creighton's "Ants of North America") is probably the first year in a century that the number of unrecognized synonyms did not gain on that of good species and subspecies.

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ROBERT SNELLING

Turlock, California

Students have known for some time that occasionally two females (queens) of *Polistes* will found a nest together. Those recorded were noted to be of the same species. However, on one occasion I have taken a female each of *Polistes fuscatus aurifer* Saussure¹ and *P. apachus* Saussure contributing toward a future colony together. As they were watched for some time there is very little chance of an error. In a letter of January 30, 1951, J. C. Bequaert comments that, "Whether queens of different species would be successful in this is not known." Unfortunately, I collected the wasps and nest at once. At the time, there were thirteen cells with larvae and eggs.

In hibernation, the social Vespidae are rather gregarious. At various times I have taken *P. f. aurifer*, *P. apachus*, *P. hunteri californicus* Bohart, *Vespula pennsylvanica* Saussure, and *Mischocyttarus flavitarsis* Saussure hibernating together. In fact, I have taken three of *aurifer*, seven of *P. h. californicus*, two of *M. flavitarsis* and a few inches away, several of *V. pennsylvanica*.

¹ The wasps were identified by Dr. R. M. Bohart. I am indebted to him and to Dr. J. C. Bequaert for help.

BOOK REVIEW

GUIDE TO THE INSECTS OF CONNECTICUT. PART VI. THE DIP-
TERA OR TRUE FLIES. FIFTH FASCICLE: MIDGES AND GNATS.

State of Connecticut Geological and Natural History Survey, Bulletin
No. 80, viii + 255 pp. March, 1952. Price \$2.50.

This new addition to the "Insects of Connecticut" series comprises a taxonomic review of the "gnats" or "midges" belonging to the families Tendipedidae (=Chironomidae), Heleidae (=Ceratopogonidae) and Fungivoridae (=Mycetophilidae). The authors, all widely recognized authorities in the groups which they present, are O. A. Johannsen, Henry K. Townes, Frank R. Shaw and Elizabeth G. Fisher. For all three families keys are given to the subfamilies and genera occurring in North America and to the species as they are known to occur in the "Northeast," or the region east of the Mississippi River and north of the southern boundary of Virginia. The authors have all adopted (though apparently under editorial duress in one case) the genera proposed by J. W. Meigen in 1800 thus necessitating changes in subfamily and family names.

The Tendipedidae, exclusive of the tribe Tendipedini, and the section on the family Heleidae, are by Johannsen. For the Tendipedidae there are keys to some 147 species recorded from the Northeast; for the Heleidae, keys to an equal number of species and illustrations of wings, male terminalia and other features for many of them.

The Tendipedini are presented by Townes as an abridgement of his recent monograph of the nearctic representatives of the tribe. He includes keys to upwards of 170 species and varieties known from the Northeast, and lists 16 species as unrecognizable without reference to the type specimens, which are either lost or not readily available for close study. There are 22 plates with excellent drawings of the male terminalia of 163 species and numerous illustrations of wings, legs and other features. In addition there are brief descriptions of each species and its recorded occurrence. Shaw and Fisher in collaboration here give the first comprehensive treatment of the Fungivoridae since Johannsen's monograph (1909-1912). There is a discussion of the ideas of various previous authors regarding the interrelationships and phylogeny of the Fungivoridae. Shaw's studies on the thoracic structures in relation to phylogeny are summarized briefly. In general the classification of Edwards (1925) has been followed. The "Lycoriidae" are considered again to be of only subfamilial rank, though this must be due to an oversight in revision of the manuscript since (Shaw (1948, 1952) considers the Lycoriidae to represent a family distinct from the Mycetophilidae. The keys differentiate over 290 species and varieties from the Northeast. There are illustrations of wings and male terminalia of several of the more difficult species and also several drawings of thoraces to show the proposed phylogenetic relationship of different genera.

A bibliography of nearly six pages lists many of the more important references to the three families. There is also a complete index to all names and illustrations. All in all this fascicle lives up to the example of its predecessors and should prove to be a most distinguished number of the "Insects of Connecticut" series.—WILLIAM C. BENTINCK.

NEW WESTERN EPHEMEROPTERA, IV, WITH NOTES

VELMA KNOX MAYO

1216 N. Fremont, Tucson, Arizona

Ephemerella lodi Mayo, new species

(Figures 1, 3, 10)

Male imago (fig. 10). Member of *bicolor*-group. Head yellow; dark brown around ocelli. Pronotum yellowish-brown tinged with red; reddish-brown penciling anteriorly on midline and laterally. Thorax reddish-brown. Mesonotum yellowish-brown dorsally, paler along midline. Laterally mesonotum reddish. Pleural sclerites reddish-brown with unsclerotized areas powdery white. Wings slightly amber tinged; venation yellow; veins in stigmatic area anastomosed. Legs yellow; fore coxae tinged with red anteriorly; femora yellow; no dark apical dot; fore tibiae yellow, reddish at tarsal joining; fore tarsi yellow, joinings narrowly penciled with red; claws reddish-brown; hind legs pale yellow, not marked with red at joinings. Abdomen lighter than thorax. Tergites 1–3 reddish-brown, bordered posteriorly by a wide brown band. On either side of midline are blackish streaks, prominent anteriorly and faded out towards posterior margin. The midline of all tergites marked with a reddish streak. Tergites 4–10 yellowish, washed with reddish-brown posteriorly. Tergites 8–9 with reddish streak near pleural fold. Blackish spots on either side of midline are very prominent, the streaks less distinct than those on tergites 1–3. Laterally each tergite marked with black oblique streak near pleural fold. Dark tracheations along pleural fold. Abdominal sternites with a distinct curved row of four dark dots, represented by two oblique streaks, and medially, by prominent dots. No ganglionic markings on sternites. Segments 3–5 pale, other segments with reddish tinge. Genitalia yellow. Tails yellow, joinings dark reddish-brown. Length: body 10.5 mm., wing 10 mm.

Female imago (fig. 3). Head yellowish with red pencilings on vertex and two red spots anterior to ocelli, blackish around bases of ocelli. Pronotum yellowish; irregularly marked with red, red streak along midline. Mesothorax reddish-brown. Mesonotum more red than that of male. Scutellum marked medially with red streak, and laterally wing bases tinged with red as in male. Legs yellow; claws faintly tinged with brown. Wings as in male except for reddish coloring at bases of subcosta and radius on anterior surface of wing. Abdomen more reddish than that of male; tergites irregularly mottled with red; along middorsal line is a wide mottled streak; tergites 1–5 with wide reddish-brown streaks on either side of midline; where the lateral streaks touch the anterior border, the margin is narrowly streaked with black; red, medially; on tergites 6–10 prominent black dots take the place of the reddish-brown streaks of preceding segments; irregular reddish markings on lateral tergites; pleural fold red; sternites paler than tergites, yellowish; row of curved black dots on sternites, prominent on segments 1–5; mid ventral ganglionic area reddish-brown on sternite five, absent on others. Dark tracheations prominent laterally. Tails as in male. Subanal plate as in fig. 3.

Holotype: male imago (in alcohol). DRY CREEK NEAR DRY

TOWN, CALIFORNIA, June 2, 1938, altitude 1700 ft. Allotype, female imago (in alcohol) same data. Paratypes one male imago, two female imagos, same data. In collection of writer, except the male paratype which is in the California Academy of Sciences, San Francisco.

The *bicolor*-group has not heretofore been represented among the known western species. *E. lodi* Mayo is allied to *E. temporalis* McDunnough and to *E. doris* Needham, but is larger than the eastern forms. Alcoholic specimens of *E. temporalis* McDunnough were loaned for comparison. The general coloring is more reddish than that of *E. temporalis*. The wings are yellow tinged and the venation yellow in contrast to the hyaline wings of *E. temporalis*. No dark dot apically on femora as in *E. temporalis*. Abdominal tergites not deep brown. No ganglionic markings on sternites of male.

BICOLOR nymph

(Figure 1)

Mr. George F. Edmunds, Jr. presented to me for study the *bicolor* nymph figured in fig. 1. I do not declare this the nymph of *Ephemerella lodi* because it has not as yet been reared. However, due to the larger size of both the nymph here figured and also of *Ephemerella lodi*, and to the similarity in type localities I recognize the possibility that the two might be the same species and enter both descriptions here.

General color dark brown sprinkled with pale dots and larger pale areas as in figure. No occipital tubercles in female. Dorsal abdominal tubercles lacking on segment 1. On segment 2 they are better developed than on other tergites, but not very long; about half the length of the distance between them, and rounded at the ends; smoky in color and marked at base with pale area. Three or four pale dots on tergites between tubercles. On tergite 3 dorsal spines smaller than those on tergite 2 and all dorsal spines decrease in size to rearward; those on segments 9-10 very minute. Spines on all tergites parallel. Width between dorsal abdominal spines on segments 5-7 less than length of tergites in median line. Tergites between tubercles rich brown sprinkled with pale dots; lateral to tubercles is a pale streak from anterior to posterior margins of segment. On segments 9-10 two narrow, pale streaks extend from anterior margins to tubercles; large pale areas as in figure. Tails dark brown, banded with pale areas; long fringe of hairs. Tails cut short in figure. Length body, 11-12 mm. Tails 8 mm.

Two female nymphs, in the collection of Mr. George F. Edmunds, Jr. Collected by E. P. Hughes north of Peoria Slough, altitude 259 ft., near Corvallis, Oregon, May 16, 1947.

HEPTAGENIA KENNEDYI McDunnough

(Figures 8, 9)

These were found to be common in the Jackson area in Amador County, California. The genitalia were treated in KOH and the number of median spines apparent are of interest (see figs. 8, 9).

Male imago, pinned (figs. 8, 9). Head brown, eyes black. Pronotum blackish along posterior border. Mesonotum yellowish-brown, bordered by dark brown on prescutum. Sutures rose tinged. The mesoscutellum and metanotum brown, speckled near wing bases. Pleuron yellow. Wings hyaline, iridescent; venation white. Fore coxae and trochanters yellow; femora reddish-brown; tibiae and tarsi dark brown, lighter than femora; femora and tibiae blackish at joinings; claws black. First tarsal segment one-fifth length of second. Middle and hind legs yellow tinged with brown along anterior border of femora and tarsi. Abdominal tergites all dark brown on posterior borders giving a distinct ringed appearance. Tergites 2-6 hyaline; tergites 7-9 brown with three yellow streaks along midline; tergite 10 lighter. Abdominal sternites 1-6 hyaline, 7-9 opaque; pale yellow. Tails brown tinged with rose, darker basally. Forceps amber tinged with rose; segments 3 and 4 of forceps together not quite as long as segment 2; 3 longer than 4. Penes amber; each with apical lobe, also with small lateral spines (see figs. 8, 9); ventrally there are three pair of spines, one very prominent, heavily sclerotized at tip, with an unsclerotized ring-like area behind tip; the other two sclerotized pieces are not so prominent, but easily detected in a specimen treated with KOH; dorsally there is a fourth pair of very large, heavily sclerotized spines. Length: body, 6-7 mm., wing, 8 mm.

Alcoholic specimens: eyes grey in some, black in others. Forelegs more pale; femora yellowish-brown, tibiae yellow with blackish joinings. Tails more pale.

Female imago, pinned; similar to male, but abdominal tergites not so distinctly ringed. In alcohol, the abdomen not ringed.

Specimens taken from Dry Creek near Dry Town, Amador County, California, June 1, 2, 14, 1938. One male imago, Amador Creek near Amador, California, May 29, 1938. This specimen is larger; length body 9.5 mm., wing 9 mm., tails pale. One imago in alcohol in collection of California Academy of Sciences. Rest of material in collection of writer.

HEPTAGENIA species number 1

(Figures 2, 6)

Male imago; reddish brown. Bases of ocelli black. Eyes grey. Pronotum mottled with red medially; anterior and posterior margins dark reddish. Pronotum yellowish laterally. Mesonotum reddish-yellow washed with red in anterior portion; sutures posteriorly tinged with red. Tergites 3-6 semi-hyaline, washed with red; 1-2 more mottled with red; 7-10 opaque, reddish-brown. Wings hyaline; veins pale yellow; stigmatic area milky. Pro- and mesopleura marked with dark reddish-brown stripe, which extends across the procoxa, around the first spiracle on the mesoepisternum and on the

epimeron at base of mesocoxa; a whitish area above first spiracle anterior to wing base. Pleuron reddish-yellow; metapleuron tinged with red around bases of coxa. All trochanters yellow (rest of legs missing in this specimen). Abdominal tergites and sternites pale along pleural fold. Large tracheal trunk and branches visible but colorless. Sternites pale except last three of abdomen which are opaque, reddish-yellow. Penes with four pair of spines (see fig. 6). The large medial spines (fig. 2) are bent at an acute angle and from the ventral view only the tips can be seen; on each side there is a sclerotized ridge for the attachment of heavy muscles (see fig. 6). The fourth segment of forceps is only slightly more than one-half the length of third segment. Segments 3 and 4 together are slightly more than one-half length second segment. Length: body, 7 mm., wing 7 mm.

One specimen taken from Dry Creek, near Dry Town, California, June 1, 1938. In collection of the writer. This specimen is undoubtedly closely allied to several western forms; *H. otiosa* McDunnough from Oregon; *H. criddlei* McDunnough from Wyoming; *H. rodocki* Traver from Idaho; *H. rubroventris* Traver, California, and *H. rosea* Traver, Oregon. The general coloration and details of the genitalia separate it from all but *H. rodocki*. I do not believe the median spines on penes of "*H. species number 1*" are capable of rotation near middle as are those of *H. rodocki*. The abdominal maculation differs in the one specimen at hand. I hope to be able to make a more thorough study of this group when more material is available.

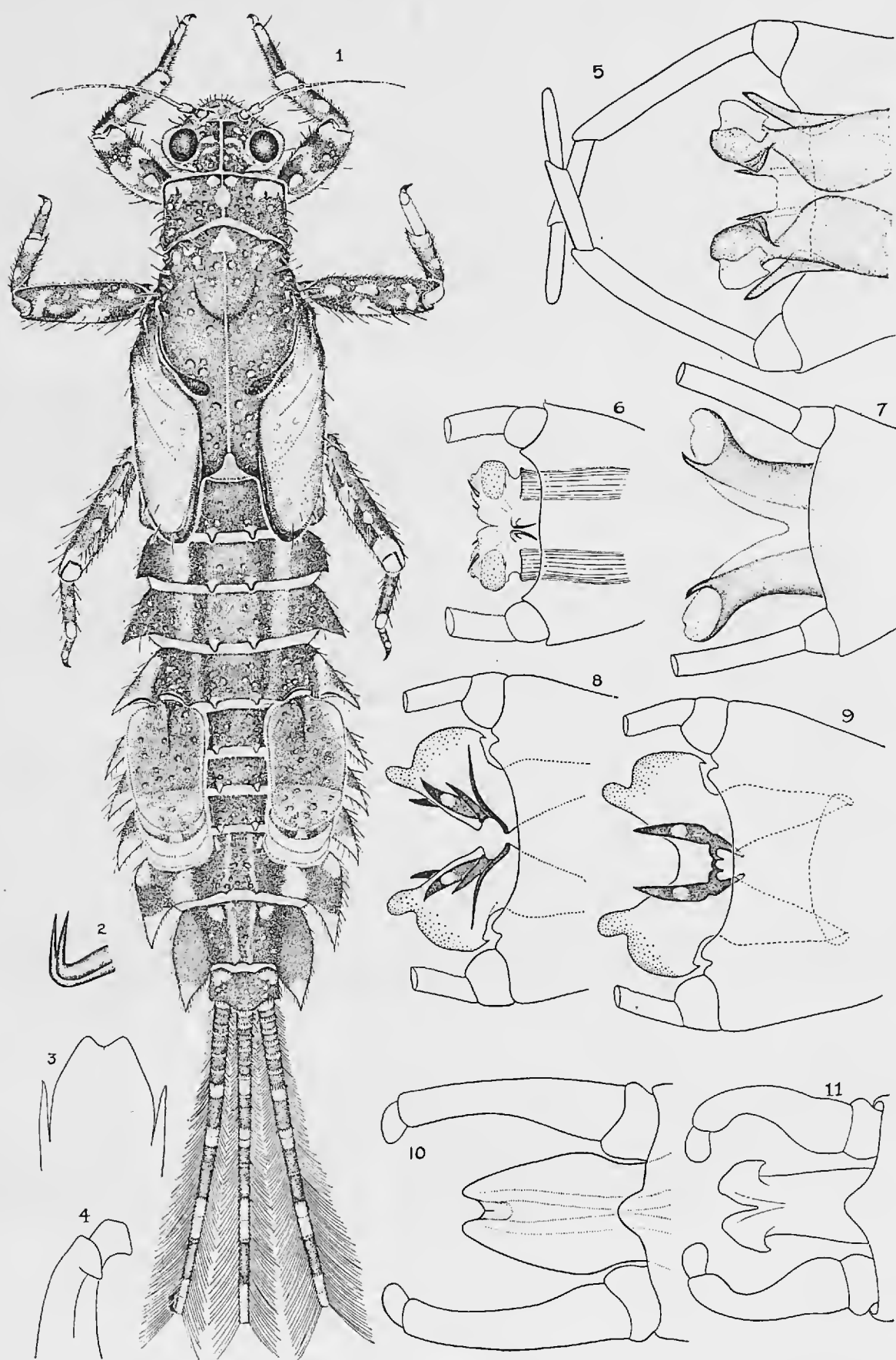
CINYGMULA PAR Eaton

(Figure 5)

Male imago, pinned (fig. 5). Head reddish-brown; white around bases of antennae. Thoracic notum black with a bluish tinge; tinged with brown laterally at wing bases. Pleural sclerites black; unsclerotized areas brown, with a pale area at wing base. Pleural wing recess black. Thoracic sternum black. Wings hyaline, iridescent except near base where they are tinged with brown; also lightly tinged in stigmatic area; venation light brown; cross veins not margined. Forelegs black; claws lighter, dissimilar; middle and hind legs dark brown; tarsi paler. Abdomen semi-hyaline; tergites washed with light brown in posterior portions, posterior borders slightly darkened with brown; anterior borders of segments 2-7 hyaline, producing an anulated effect; tergites 1-2 darker brown, 3-7 pale, 8-10 dark brown; all tergites with brown tracheations. Abdominal sternites 1-2 light brown;

EXPLANATION OF FIGURES

Figure 1—Nymph of *bicolor*-group of *Ephemerella*. Figure 2—Median spines on penes of *Heptagenia* species number 1. Figure 3—Subanal plate female, *Ephemerella lodi*, new species. Figure 4—Lateral view penes, *Ephemerella* species number 2. Figure 5—Male genitalia *Cinygmula par* Eaton. Figure 6—Male genitalia *Heptagenia* species number 1. Figure 7—Male



genitalia *Cinygmula tioga* new species. Figure 8—Ventral view male genitalia *Heptagenia kennedyi* McDunnough. Figure 9—Dorsal view, same, of *H. kennedyi*. Figure 10—Male genitalia *Ephemerella lodi* new species. Figure 11—Male genitalia *Ephemerella* species number 1.

2-6 hyaline except for prominent dark brown ganglionic markings; 7 opaque white, 8-9 darker. Forceps and forceps base blackish. Penes with lateral and medial spines (sclerotized areas of penes represented by shading in figure), tails dark brown basally, lighter distally.

Female, pinned. More uniformly colored than male. Head blackish-brown; thorax black; notum black tinged with brown posteriorly. Wings hyaline, tinged but slightly near base; much less so than in male. Legs reddish-brown. Abdominal sternites more uniformly brown than those of male; sternites 3-6 pale with dark brown ganglionic markings, 7-8 brown, 9 pale with subanal plate dark smoky. Tails light brown.

Two male imagos, pinned. Shadow Creek near Mineret Glacier, Madera County, Sierra Nevada of California; altitude 9,560 ft., September 10, 1939. Female imago, pinned, same data; vial of alcoholic material both sexes, same data.

General coloring different from that of the type of *C. par*, black in contrast to the light brown coloring of the type. Dr. Herman T. Spieth writes the following about the type of *C. par* Eaton:

"There is no sign of the blackish or sepia pigmentation being intermixed into the brown ground color. The specimens appear brownish yellow rather than blackish brown . . . Penes very much like those of *confusa* McD. and *C. hyalina* McD."

The wings of these specimens are not grey-tinged as are those of the type. One male imago in alcohol in California Academy of Sciences. Other specimens in collection of writer.

Cinygmula tioga Mayo, new species

(Figure 7)

Male imago (fig. 7). Pale species with uniform amber tinged wings. Head yellowish; wide black bands around ocelli; fine brown pencilings on vertex. Pronotum visible only from sides, penciled with reddish brown. Mesonotum yellowish brown. Sutures and medial part of scutellum powdery white. Postscutellum and metanotum brown. Pleuron pale yellowish brown with powdery white in unsclerotized areas, particularly anterior to wing base. Wings tinged with amber; veins narrowly dark brown. Forelegs pale; femora yellowish, slightly smoky at tibial joining. Dark brown elbow at joining of tibiae and tarsus. First tarsal segment three-fourths length second. Joining of fourth and fifth tarsal segments narrowly brown. All claws similar; washed with brown. Tergites 1-8 semi-hyaline. The anterior margins of segments 2-8 are pale, the remainder of segments washed with brown, giving a banded appearance. Dark lateral tracheations on each of tergites 1-8. Tergites 8-10 yellowish brown. Sternites more pale than tergites; segments 1-8 hyaline; 8-9 opaque, yellowish brown. Slight traces of ganglia apparent by a few brown ventral markings in some specimens. Forceps brown (segments 3-4 have been broken off in all specimens). Sclerotized portions of penes brown, unsclerotized portions white. Penes each with one pair of medial spines. Tails light brown. Length: body 8 mm., wing 8.5 mm.

Female imago similar to male, but with paler wings. Abdominal tergites more opaque due to eggs in abdomen. Tracheations same as in male. No ventral ganglionic markings.

Holotype, male, and 7 male imagos (in alcohol) LEEVING CREEK, SIERRA NEVADA MOUNTAINS, MONO COUNTY, CALIFORNIA, August 21, 1938, altitude 9,900 ft. Eight female imagos, same data. Four males in alcohol in collection of California Academy of Sciences. The rest in collection of writer.

Cinygmula tioga Mayo is related to *C. minus* Eaton. In general appearance *C. tioga* is paler, yellowish-brown; whereas *C. minus* is more of a chestnut brown. The wings of *C. minus* are darker in basal half of fore wing and in hind wing. In *C. tioga* they are uniformly tinged a lighter amber as in *C. uniformis* McDunnough. Venation in *C. minus* paler than that of *C. tioga*. The abdominal markings vary somewhat. There are no tracheations on tergites of *C. minus* and these are prominent on *C. tioga*. Traces of dark ventral markings entirely lacking on *C. minus*. Genitalia of the same type, but the spines on *C. tioga* are longer.

EPHEMERELLA species number 2

(Figures 4, 11)

Male imago (figs. 4, 11). Head yellowish-orange; dark brown around bases of antennae and ocelli. Prothorax yellowish-orange with dark brown tracheations. Cervical membrane rose colored. Mesonotum yellowish-orange, tinged with rose posteriorly, and around wing bases. Unsclerotized areas of the entire thorax are distinctly rose colored. The mesoepisternum posterior to spiracle and the epimeron are brown. Wings hyaline except in the stigmatic area. Venation very faint. Legs pale yellow. Fore femora yellowish apically, tibia tinged with brown at apical joinings and claws light brown. Abdominal tergites rose colored, darkened laterally. Anterior and posterior margins hyaline giving an annulate appearance to abdomen. Brown tracheations on tergites. Sternites also rose colored, but pale; the lateral anterior corners are darker rose and the prominent ganglionic markings are light brown. Genitalia somewhat as in *E. micheneri* Traver. Tails white with reddish joinings. Length: body 8 mm., wing 7 mm.

Two male imagos were taken from Dry Creek, near Dry Town, California, May 30, and June 2, 1938. In collection of writer.

"*Ephemerella* species number 2" is a member of the Serrata group and is similar to *E. micheneri* Traver. Possibly it may be identified as *E. micheneri* when more material is at hand, but in the two male imagos collected there are variable characters which are of interest. Coloring of entire body distinctly reddish. Blackish markings on pleura, coxae and sterna as described in *E. micheneri*. Forceps similar to those of *E. micheneri* and penes separated api-

cally by a V-shaped cleft. Each side is bent forward and ends in a sharp process which does not project upward in lateral view of *E. micheneri*. More conclusive evidence as to the identity of "*E.* species number 2" may be revealed when the nymphs are known and reared.

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SUGGESTIONS ON PREVENTING OUTBREAKS OF BARK BEETLES IN CALIFORNIAN PINE FORESTS

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San Francisco, California

The following suggestions result from observations made in Shasta County, California, during 1951. It is a pleasure to express my indebtedness to Dr. Ralph Hall and Mr. F. P. Keen, who enabled me to make use of the facilities of the entomological laboratory at Hat Creek, Shasta County.

The commonest and most important bark beetles in Californian forests are the following (quotations are from F. P. Keen's book "Insect enemies of western forests," U. S. Dept. Agric., Miscell. Publ. No. 273; 210 pp., 92 text figs. 1938).

1. *Dendroctonus brevicomis* LeConte.—"Normally it breeds in a few overmature trees, in windfalls, unhealthy trees, or in trees weakened by drouth, stand stagnation or fires."

2. *Dendroctonus monticolae* Hopkins.—"During endemic infestations there is a tendency for the beetles to select the weaker, less vigorous trees for attack, but no such selection is apparent during epidemic conditions."

3. *Dendroctonus jeffreyi* Hopkins.—"Although it often attacks trees that are apparently in a healthy condition it seems to prefer trees that are retarded in growth by droughts or defoliations."

4. *Ips emarginatus* LeConte.—"The emarginate ips (*I. emarginatus* Lec.) is most frequently found associated with the mountain pine beetle in its attacks on ponderosa pine, lodgepole pine,

and sugar pine, and with the Jeffrey pine beetle in Jeffrey pine, but is quite capable of and occasionally does kill trees on its own account."

Epidemic outbreaks of bark beetles in California must always have as a preliminary a great number of weakened or less vigorous trees. By comparison of conditions in places where there is no bark beetle problem with those in which there is damage, we see at once a difference in the extent to which tree trunks are exposed to the sun's rays. From an examination of forests in the mountainous regions, it is evident that the bark beetles have attacked only such trees as have been overexposed to the sun, and thus burnt or scalded. Such damage is not readily detected; the trees appear to be healthy, but the beetles are well able to distinguish them.

Because of their growth habits pines, especially ponderosa pine, have very few branches and twigs, and are unable to shade their trunks from the burning rays of the sun. Consequently they are very often attacked by bark beetles. When it is seen that there is a connection between tree trunk exposure and epidemics of bark beetles, a preventative control measure will obviously be the shading of such trunks from the sun's rays.

The forest trees of Shasta County can be divided into two groups, based on degree of resistance to the sun.

TREE SPECIES WHICH ARE VERY SENSITIVE TO THE SUN'S RAYS

- | | |
|------------------------------------|------------------------------------|
| 1. <i>Pinus ponderosa</i> Dougl. | —Ponderosa or western yellow pine. |
| 2. <i>Pinus jeffreyi</i> Vasey | —Jeffrey pine. |
| 3. <i>Pinus lambertiana</i> Dougl. | —Sugar pine. |
| 4. <i>Pinus contorta</i> Dougl. | —Lodgepole pine. |

TREE SPECIES WHICH CAN WITHSTAND THE SUN'S RAYS

- | | |
|--|------------------------|
| 1. <i>Libocedrus decurrens</i> Torr. | —Incense cedar. |
| 2. <i>Abies concolor</i> Lindl. & Gord. | —White fir. |
| 3. <i>Picea engelmannii</i> Engelm. | —Engelmann spruce. |
| 4. <i>Tsuga mertensiana</i> Sarg. | —Mountain hemlock. |
| 5. <i>Juniperus californica</i> Carr. | —California juniper. |
| 6. <i>Quercus kelloggii</i> Newb. | —Black oak. |
| 7. <i>Quercus douglasii</i> H. & A. | —Blue oak. |
| 8. <i>Prunus demissa</i> (Nutt.) Walp. | —Western choke cherry. |
| 9. <i>Prunus emarginata</i> (Dougl.) Walp. | —Bitter cherry |
| 10. <i>Ceanothus integerrimus</i> H. & A. | —Deer brush. |
| 11. <i>Arctostaphylos</i> sp. | —Manzanita. |

The degree of resistance to the sun's rays depends chiefly on the type and thickness of bark, and the density and distribution of foliage. The tree species which are very sensitive to the sun

should not be allowed to grow in pure stands, but should have incense cedar or other trees from the second group planted amongst them. Ponderosa pine does very well when in a mixed stand with incense cedar or white fir (individual trees of *P. ponderosa*, which have from youth been in exposed positions, are able to grow long low branches and protect themselves; but this does not apply in pure stands).

Man thus has an opportunity to make the pine forests more resistant to bark beetle epidemics, by adding sun-tolerant species to young stands of sun-sensitive trees. This work can be related to the establishment of fire protection strips, especially along roadways, since shade producing trees also reduce the fire hazard.

Of course such problems can not be solved by the entomologists alone, since botanical and economic matters are also involved. However, it seems clear that there are possibilities in this subject, and future generations will have much to thank us for if we can reduce both bark beetle and fire hazards.

A NEW SYNONYM IN XENORHIPIS

(Coleoptera: Buprestidae)

JACQUES R. HELFER

Mendocino, California

Dr. Jan Obenberger in Vestnik Svazek VI-VII, Za Rok (1938-1939:338) described a new species of *Xenorhipis* under the name *X. vej dovskyi*. The type series of *X. vej dovskyi* consisted of six specimens. Of the two in Obenberger's collection, one, which he acquired by purchase, is labeled from Connecticut, U.S.A., and the other, bearing no locality label "but most probably from the same collector" was sent to him in an exchange by the Museum d'Histoire Naturelle de Paris, bearing a label "*Xenorhipis Brendeli* LeConte." This second specimen belonged in turn to the Meyer-Darcis and Kerremans collections. The other four specimens of the series upon which he based his new species are designated thus: "I have seen, in Paris, in the collection of Kerremans, still some four specimens of the same new species." Dr. Obenberger had no specimens which he considered to be *X. brendeli* and based his comparative notes upon the description given by LeConte.

He contrasted certain characters of *X. brendeli* and his *X. vej-*

dovskyi and I have arranged these dichotomies in the forms of a table for ease of perusal.

<i>X. brendeli</i> LeConte	<i>X. vejovskyi</i> Obenberger
1. Body dull black with a brassy tinge.	Body black, without any brassy tinge.
2. Head convex with a broad medial furrow.	Head convex without any medial furrow.
3. Thorax (pronotum) quadrate with the angles acute, slightly channeled and marked with a strong transverse impression just before the middle.	Thorax (pronotum) transverse, having the greatest width on the basal third, rather strongly and obliquely attenuate to the base, very feebly to the anterior angles, feebly and equally convex, without any impressions.
4. Elytra dull black, with a brassy tinge, ornamented with a large pale spot which extends nearly one-third the length and fades insensibly into the black ground color.	Elytra pale yellow, with a long triangular scutellar macula, extending from the base nearly to the basal third, of the same black, piceous colour as the prothorax.
5. Sernum marked on each side with a large hairy depression.	Without any distinct hairy depression on sternum.
6. Length 5 mm.	Length 6 mm.
7. Illinois.	Connecticut.

Reviewing these characters, I was struck by the apparent tautological nature of the fourth dichotomy and the possible variability of some of the other characters. But by the time I decided I decided to pursue the matter farther it was impossible, because of international conditions, to carry on correspondence with Dr. Obenberger. Fortunately, however, I was able to secure the loan of two of the specimens in the Paris museum which were mentioned by Dr. Obenberger, through the kind cooperation of Mr. A. Descarpentries of that institution. These specimens are both from Crafton, Pennsylvania, Klages collector. They are labeled "*Brendeli* LeConte" and formed part of the Kerremans collection, being so labeled.

There are no other specimens of *Xenorhipis* in the Paris museum and there can be no doubt that these specimens are the ones alluded to by Dr. Obenberger. In the light of this, I feel justified in considering these two specimens as putative paratypes of Obenberger's species.

Having studied the male type of *X. brendeli* LeConte in the

Museum of Comparative Zoology at Cambridge in 1942, and having seen an almost identical male in the Boston Museum collection, I was a little unnerved at the sight of the two putative paratypes, both males of *X. vejdoskyi*, which looked quite different from the LeConte type, as well as different from the published figures in Knull, Horn, and Kerremans. However, I checked both paratypes against my table of dichotomies with the following results:

1. One of the paratypes is uniformly dark above, vaguely purplish on the elytra, a little brassy on the head and pronotum with no definite elytral markings whatever, merely a slight lightening on the side margin at about the middle of the elytra and a vague lessening of intensity of color where the elytral markings usually occur. These lighter areas can only be discerned by turning the specimen around and tilting it in a favorable light under fair magnification. To the unaided eye the elytra appear uniformly dark. The other paratype is colored about like Dr. Obenberger's figure of *X. vejdoskyi*. This indicates that the color of the elytra is an unstable character here since two of the putative paratypes are so differently marked. Dr. Obenberger did not mention this difference in color between two of the "specimens of the same new species."

2. The dark paratype has the body black with a slightly brassy tinge whereas the light paratype has the body shining black with no brassy tinge, indicating that this character is variable here, and by this token, valueless.

3. The dark paratype has a distinct median impression on the head whereas the light one has the front nearly evenly rounded with only a very slight impression, indicating that this character also is variable and useless.

4. The dark paratype has the pronotum medio-longitudinally narrowly impressed and transversely broadly medially depressed whereas the light paratype has neither impression, indicating that this character is variable (as, indeed it is also among certain other *Anthaxites* as well).

5. The dark paratype has the sides of the pronotum broadly arcuate from the anterior angles to the first fourth, then parallel to the posterior angles which are acute, whereas the light paratype has the pronotal margins about as figured by Dr. Obenberger for *X. vejdoskyi*, that is broadly arcuate from the anterior angle to the posterior fourth, then angling in more strongly to the posterior angles which are obtuse, indicating that this, too, is a variable character, and of no value here.

6. The pronotum of the dark paratype is noticeably less strongly transverse than that of the light one but is not truly quadrate, indicating still another variable and unusable character.

7. The length of the dark paratype is 5.3 mm. while the light one measures 6 mm. in length, another variable character.

8. Both paratypes were fastened with generous amounts of glue to little cards and the sterna were unobservable. I therefore carefully removed the specimens from their cards and found, in direct contradiction to Dr. Obenberger's statement, that the sterna of both paratypes were strongly modified at both sides by large conspicuous oblong oval hairy depressions.

Having an opportunity to visit the Museum of Comparative

Zoology again in 1950 I re-examined the LeConte type of *X. brendeli* and confirmed my previous impression that the two paratypes of *X. vej dovskyi* differ in general appearance at least as much between themselves as from the type of *X. brendeli*.

I believe that I have demonstrated that all of the characters, except one, which are said by *Dr. Obenberger* to separate *X. vej dovskyi* from *X. brendeli* are quite variable and useless in specific differentiation by pointing out the great differences which exist between two of the specimens which he said belong to his new species and which I feel justified in considering as paratypic. The excepted character, a sexual one, is the possession of a large hairy depression on each side of the sternum, characteristic of *X. brendeli* and the absence of which was supposed to distinguish *X. vej dovskyi*. The condition of this important character is found to be exactly the same in specimens which *Dr. Obenberger* designated as representative of his new species as in the type of *X. brendeli*. *Xenorhipis vej dovskyi* *Obenberger* should be listed as a synonym of *Xenorhipis brendeli* *LeConte*.

MISCELLANEOUS NOTES ON THE TAXONOMY OF SOME APHID SPECIES

(Aphididae)

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Contarini (1845) lists 46 species of the genus *Aphis* as belonging to the family *Psyllidae*. Of these, seven species are incorrectly accredited to *Latreille*. One species, *Aphis nivea*, may or may not be correctly associated with the name of *Latreille*, but I have not been able to locate a species by that name in the works of *Latreille* which I have examined, neither have I been able to locate a species by the name of *Aphis nivea* in the literature. It may be regarded for the time being as a *nomen nudum*. The remaining species listed by *Contarini* are either correctly or incorrectly associated with the name of *Fabricius*.

In the February issue of "Entomological News," published in 1917, *G. O. Shinji* described as new *Myzocallis essigi*. The type slide of this species, now in the collection of *E. O. Essig*, contains a number of species representing several genera. Through the kindness of *Professor Essig* I have had an opportunity to study this slide. *Essig* (1917:324) regards the species named for him as a

synonym of *Myzocallis quercus* (Kaltenbach) a species which has since that time been recognized as a synonym of *Myzocallis annulatus* (Hartig). Swain (1919:17) is in error when he states that *M. essigi* is a variety of *M. quercus*.

In the same paper that Shinji described *M. essigi*, he also described as new *Myzocallis woodworthi*. The type slide, like that of *M. essigi*, contains a number of different species. It is in the collection of Professor Essig and has been seen by me. Unfortunately in his original description Shinji describes a male, which has since been indicated as the type, as an alate viviparous female. He further complicates matters by not adequately nor accurately describing the dusky areas on the abdomen, and compounds the confusion by attributing dorsal tubercles to the abdomen, structures absent on the male which he described and also lacking on the abdomen of a single alate viviparous female of the same species, mounted on the type slide. This would indicate that he was confusing specimens of *woodworthi* with *essigi*, there being several specimens of the latter species on the slide.

It should also be noted that figure II, plate VII, inaccurately illustrates the dusky areas on the abdomen; the sensoria on antennal segment three, indicate as does his explanation that the specimen is an alate viviparous female. It will be noted that the abdomen does not show the dorsal tubercles called for in the description. Figures 13, 14, 15, and 16 represent the antennal segments of the male, but are labeled as those of an alate viviparous female.

Professor Essig in 1917 regarded *M. woodworthi* as the male of *M. quercus* (Kaltenbach) and in this Baker concurred. Swain in 1919 considered *woodworthi* to be a variety of *M. quercus*. Both Essig and Swain were in error in their beliefs, both probably being led astray by Shinji mentioning the presence of dorsal tubercles on the abdomen. The specimens described by Shinji belong to the species named by Buckton *Callipterous castaneae* which Baker in 1917 renamed *Myzocallis castanicola* which name now becomes a synonym of *Myzocallis woodworthi* Shinji. *Myzocallis davidsoni* Swain is also a synonym of *woodworthi* as others have already indicated it as a synonym of the species named by Baker.

The following species are recorded from Colorado for the first time: *Thelaxes californica* Davidson taken on scrub oak at Skyway, Grand Junction, and Gateway, Colorado, during the summer and fall of 1949 and fall of 1950; and *Periphyllus americanus* (Baker) taken on sugar maple at Grand Junction in 1949.

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NEW RECORDS OF *LEPTINUS TESTACEUS* FROM
NORTH AMERICA

(Coleoptera: Leptinidae)

A single male specimen of *Leptinus testaceus* Müller was taken from the body of a shrew, *Sorex trowbridgii humboldtensis* Jackson, trapped in the vicinity of Prairie Creek State Park, Humboldt Co., California, June 15, 1951. The species has also been taken, but apparently not reported, at Port Angeles, Washington, May 25, 1907, by E. C. Van Dyke. Three previous North American records for this ectoparasite are the following: Cincinnati, Ohio, from nest of *Blarina brevicauda* (Say) (Charles Dury, 1892, *Cincinnati Jour. Sci.* 14:183); Forrester Island, Alaska, from the bodies of freshly killed shrews (V. L. Kellogg, 1914, *Science*, 39:360); Silver Creek (about 11 miles SW. of Salmon Arm), British Columbia, from a species of *Sorex* (G. R. Hopping, 1949, *Proc. Ent. Soc. Brit. Columbia*, 45:16).—D. J. GOULD and R. S. BEAL, JR.

A NEW TROPICAL HEBRID

(Hemiptera)

CARL J. DRAKE

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The present paper contains the description of a new species of *Merragata*, family Hebridae, from Panama and Mexico. The types are in my collection.

***Merragata quieta* Drake, new species**

Macropterous form: Short, small, slender, brown, sometimes with the pronotum becoming darker towards the sides. Head brown, sparsely clothed with scattered pale hairs; median longitudinal furrow wide, divided by a narrow median ridge. Eyes small, reddish, coarsely faceted. Antennae short, slender, testaceous, shortly pilose; segments I, II, III subequal in length and thickness, pale testaceous; IV longer, stouter, brown, clothed with longer hairs; formula—I, 9; II, 9; III, 9; IV, 12. Rostrum long, slender, testaceous, reaching to base of metasternum. Legs slender, rather short, testaceous, sparsely clothed with short pale hairs. Middle and hind coxae widely separated so as to form a wide sternum, the sternum flattened or impressed.

Pronotum brown, often darkened laterally, moderately narrowed anteriorly, deeply pitted, shallowly longitudinally furrowed on median line, with a deep impression on each side just back of collar; humeral angles not very prominent, slightly impressed within. Exposed part of mesonotum very short, brown, not wider than scutellum. Scutellum small, brown, almost triangular in outline, with narrow median carina, the outer edges on each side also narrowly ridged; the length and width subequal. Hemelytra fumose with base and three spots in apical area white; two veins dark brown, prominent, narrowly separated with narrow space between them white, apically with the inner vein turned abruptly so as to unite obliquely the two veins, the posterior margin almost obliquely truncate (feebly rounded). Dorsal surface of head, pronotum and hemelytra sparsely and inconspicuously clothed with pale hairs, the veins of hemelytra more hairy than membrane; sides of body also with short hairs. Abdomen beneath fuscous-brown with bluish lustre. Apterous form unknown. Length, 1.55 mm.; width, 0.50 mm.

Type (male) and *allotype* (female), CANAL ZONE, PANAMA, Feb. 10, 1939, C. J. Drake, *Paratypes*: 6 specimens taken with type; 2 specimens, C. Valles, Mex., July 17, 1950, C. J. Drake; and 1 specimen, Rio Frio, Colombia, March 10, 1918, Darlington.

This tiny species is most closely related to *M. hebroides* B.-White, but separated from it by its narrowed form and much shallower pronotal sulcus. *M. brunnea* Drake is a lighter colored species with the part of vein connecting the two veins distinctly rounded instead of obliquely truncate.

An examination of the type of *M. slosson* Van Duzee in the California Academy of Sciences shows this species to be a synonym of *M. hebroides* B.-White (*new synonymy*).

NOTES AND A NEW SPECIES IN CYBAEINA

(Arachnida: Agelenidae)¹

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Since the erection of the genus *Cybaeina* for *Cybaeus minutus* Banks by R. V. Chamberlin and W. Ivie in 1932, two more species have been added, *C. xantha* Chamberlin and Ivie, 1937, and *C. confusa* Chamberlin and Ivie, 1942. The additional species, including *C. sequoia* n. sp. described in this paper, makes it necessary to broaden the previous concept of the genus.

The genus includes all those Cybaeinae which bear four or five pair of ventral spines on Tibia I and lack two stout spines on the anterior distal portion of Femur I. The internal female epigynum lacks bulbous spermathecae and the patella of the male palpus bears a small ectal process. The carapace and legs lack dusky markings, the abdomen is yellow or, in the case of *C. sequoia* n. sp., pale gray with very faint markings. Size over 2.8 mm.

These spiders are known only from the damp forests along the northern Pacific Coast. Of the four species, three are found in western Oregon, one of which extends into Washington. One species is described from northern California. Their habitat is similar to that of *Cybaeus*, i.e. under bark, rocks, boards, logs, and moss in damp coniferous forests. Webs are apparently seldom used.

CYBAEINA CONFUSA Chamberlin and Ivie

(Figures 2, 3, 6)

Cybaeina confusa Chamberlin and Ivie, 1942. Bull. of the U. of Utah, 32(13):19, fig. 38, (♀).

C. confusa Chamberlin and Ivie was described from "Oregon" from one female. Additional specimens show a variability in the structure of the female epigynum.

Externally the female epigynum consists of a thin and smooth sclerotized sheet with a single transverse median opening mesal to the posterior loop of the spermathecae. The opening is a faintly visible slit, slightly curved on the antero-lateral edge, forming an undulating edge. Posterior to the opening is a calvous area representing the "median sclerite." The convoluted spermathecae are visible through the sclerotized sheet as illustrated in fig. 3. The connecting canals are not visible. Lateral to the center of the spermatheca are two shallow depressions.

¹ Published with the approval of the Oregon State College Monographs Committee, Research paper No. 208, Department of Entomology, School of Science.

The internal epigynum consists of two separate and more or less identical halves; one side is described. The transparent connecting canals arise on the median line on the posterior third of the sclerotized sheet. The canals are fused at the opening, extend dorsally a distance of about twice their diameter where they divide. Each canal extends laterally to the edge of the spermatheca, turns anteriorly and then ventrally where it connects with the heavily sclerotized spermatheca. The latter consists of a strongly convoluted and compact tube as illustrated in fig. 2. The position of the canals deviate somewhat in many specimens but the general pattern is the same. Posteriorly the spermatheca narrows abruptly, forming the fertilization duct.

Chamberlin and Ivie's illustration of the epigynum of *C. confusa* indicates two circular sclerotized areas at the posterior lateral edges of the spermathecae. These areas are visible only when the coils of the spermathecae are arranged in a certain position.

Male—Color: Carapace and legs whitish-yellow. Mouthparts and sternum light yellow. Eyes ringed with violet. Abdomen whitish-grey. No dark markings.

Structure: Typical of genus. Carapace widest opposite anterior end of the thoracic furrow. Thorax evenly convex, sloping forward to the eyes from a point about one-third the distance from the eyes to the thoracic furrow. Sides of head slightly convergent anteriorly. Posterior eye row slightly procurved. Anterior eye row slightly recurved. Eye ratio: AME : 3.7, PME : 5, ALE : 6, PLE : 6. AME about two-thirds their diameter apart, and less than a radius from the ALE. Lateral eyes about two-thirds their diameter apart. PME slightly less than two diameters apart and separated from the PLE by one and one-third diameters. Clypeus one and one-third diameters of an ALE. Chelicerae almost straight, three teeth on the promargin and three or four teeth and six very small denticles on the retromargin. Fang normal with usual row of overlapping hairs. Labium slightly wider than long, about half as long as the endites and indented slightly distally. Endites converge slightly distally. Dense scopula on mesal half of anterior margin and serrula present on lateral half. Sternum shield-shaped, longer than wide, produced to a point between the hind coxae.

Abdomen sub-ovate. Anterior and posterior spinnerets widely separated. Anterior spinnerets two-segmented, the basal segment slightly conical, the distal segment hemispherical. Posterior spinnerets two-segmented², similar in shape but more slender and shorter than the anterior spinnerets. Colulus divided, each half represented by one hair (other specimens have up to four or five hairs). Opening of the spiracle slightly anterior to the colulus.

Palpus typical for genus. Patella with a slender ectal process extending ectally at right angles and terminated by four teeth (three in some specimens). Tibia with a stout cariniform process ecto-ventrally extending almost its entire length. Embolus smooth for its entire length. Legs of moderate length. Tibiae I and II with four pairs of spines ventrally. All metatarsi with 2-2-3 spines ventrally. Tarsal claws bear 10-12 teeth, median tarsal claw bears 2-4 teeth.

²The author found that the posterior spinnerets of other genera of Cybaeinae, e.g. *Cybaeus* and *Cybaeota*, are at least secondarily segmented.

Measurements in millimeters:

Total length: 3.8. Average 3.46. (3 ♂ ♂) Range 3.15–3.8.

Carapace		Metatarsus	
length	1.80	I	1.26
width	1.46	IV	1.77
head width	.62		
eye width	.45		
Femur		Tarsus	
I	1.73	I	1.19
IV	2.04	IV	1.22
Tibia-Patella		Total	
I	2.14	I	6.32
IV	2.21	IV	7.24

Allotype: Male. Collected by the author one mile west of CASCADIA, OREGON, Sept. 5, 1948, with two additional males and three females.

The allotype is deposited in the California Academy of Sciences, San Francisco. The holotype is in the University of Utah at Salt Lake City, Utah.

Distribution: West side of the Cascade Mountains in Linn and Benton counties, Oregon. Wren, Nov. 19, 1950 (2 ♀ ♀); 27 mi. N.E. Sweet Home, March 7, 1948 (2 ♀ ♀); Foster, April 18, 1948 (♀); Mary's Peak, Benton Co., June 17, 1949 (♀) F. Beer; 1 and 13 miles E. of Cascadia, July 23, 1949 (♂ and 2 immature ♂ ♂) F. Beer and V. Roth.

Most of the immature or teneral specimens of *C. confusa* bear a pinkish pigment around the eyes. This was not present in older specimens. The females ranged in size from 3.2 mm. to 5.6 mm. with the average of 4.17 mm.

Cybaeina sequoia Roth, new species

(Figures 1, 4, 5)

Holotype: Male. Color: Carapace light yellowish-orange with very slight traces of dusky markings. Eyes ringed with black. AME with a connecting black band as are the ALE and PLE. The black ring of the PME just touches the ring of the ALE. Chelicerae, endites, and labium brownish-orange. Sternum slightly lighter, darker around edges. Legs yellowish, becoming darker distally. Abdomen gray with a light median lanceolate mark over the heart. Two faint, light gray chevrons are present on the posterior half of the abdomen. Venter is light gray. Spinnerets yellow.

Structure: Typical of the genus. Carapace widest opposite anterior end of the thoracic furrow. Thorax evenly convex, sloping forward to the eyes from a point about one-third the distance from the eyes to the thoracic furrow. Sides of head slightly convergent. Posterior eye row moderately re-curved. Anterior eye row straight. Eye ratio: AME:5.5, PME:9, ALE and

PLE:10.5. AME two-thirds of their diameter apart and slightly less than a radius from the ALE. Lateral eyes less than a radius apart. PME about one and one-third diameters apart and separated from the PLE by slightly less than their own diameter. Clypeus slightly narrower than the diameter of an ALE. Chelicera almost straight, three teeth on the promargin and four widely spaced teeth and seven denticles on the retromargin. Fang with usual row of overlapping hairs. Labium slightly wider than long, more than half as long as the endites and slightly notched distally. Endites converge slightly distally. Dense scopula on mesal half of anterior margin and serrula present on ectal half. Sternum shield-shaped, slightly longer than wide. The lateral edges are undulated and posteriorly the sternum is produced to a point between the hind coxae.

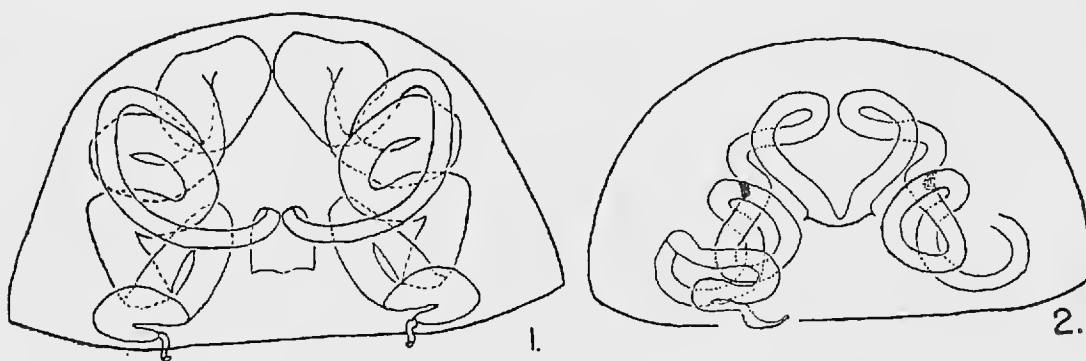


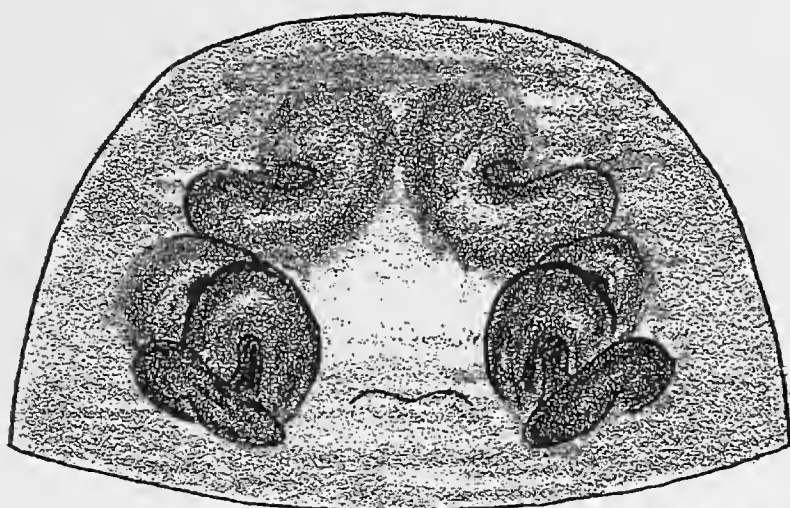
Fig. 1. Dorsal view (internal) of female epigynum of *Cybaeina confusa* Chamberlin and Ivie. Fig. 2. Same, of *Cybaeina sequoia* new species.

Abdomen sub-ovate, three-quarters as wide as long. Anterior and posterior spinnerets widely separated. Anterior spinnerets two-segmented, conical basal segment stout, distal segment short, hemispherical. Posterior spinnerets secondarily two-segmented, the distal segment very short, faintly visible with 40X magnification. Colulus divided, each half represented by two hairs. Opening of the spiracle slightly anterior to the colulus.

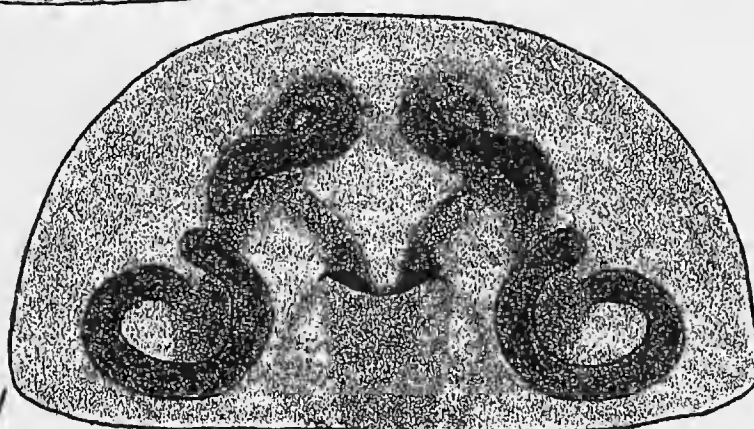
Palpus typical for genus. Embolus bears two recurved teeth flanked by a pair of shorter teeth about halfway from the base. Process of the patella arises ectally and curves distally. Right process bears four stout teeth and the left process bears five. (Most paratypes bear four teeth, one bears three). Tibia bears a stout cariniform process ectally, about two-thirds its length. Legs of moderate length. Tibiae I and II bear five pair of spines ventrally. All metatarsi bear three pair of spines. Upper tarsal claws bear nine teeth ventrally. Median tarsal claw bears six teeth ventrally.

EXPLANATION OF FIGURES

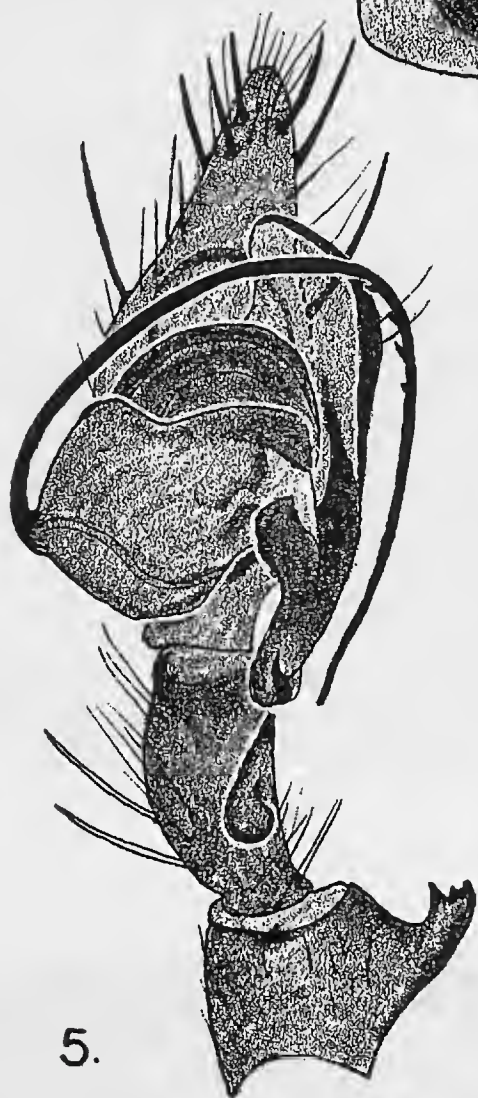
Fig. 3. Ventral view (external) of female epigynum of *Cybaeina confusa* Chamberlin and Ivie. Fig. 4. Same, of *Cybaeina sequoia* new species. Fig. 5. Ventral view of left palpus of male of *C. sequoia*. Fig. 6. Same, of right palpus of *C. confusa*.



3.



4.



5.



6.

Measurements in millimeters:

Total length 4.3. Average 9 ♂ ♂ 4.12 Range 3.7-4.4.

Carapace		Metatarsus	
length	2.38	I	1.90
width	1.84	IV	2.52
head width	.90	Tarsus	
eye width	.64		
Femur		I	1.39
I	2.35	IV	1.39
IV	2.55	Total	
Tibia-Patella			
I	3.06	I	8.70
IV	3.09	IV	9.55

Allotype: Female. Color: Similar to that of male but slightly darker. Abdomen light gray, no lighter markings.

Structure: Generally the same as the male. Sides of the head straight. Eyes slightly smaller, and ratio differs slightly: AME:5, PME:9, PLE:9.5, ALE:10. Posterior eye row recurved slightly more than in the male. Right chelicera with five teeth, eight denticles on the lower margin. Left chelicera with seven teeth, eight denticles on the lower margin.

Epigynum: The external epigynum consists of a thin and smooth sclerotized sheet with sclerotized depressions (lateral sclerites) anterior to the lateral connecting canals. The center of the sheet is crossed by a short, undulating, transverse lip formed by the fusion of the two open ends of the connecting canals. Posterior to the opening is a transversely ovate depression which is lined by a median trapezoidal sclerite. The connecting canals are visible through the sclerotized sheet as illustrated in fig. 4. (The positions of these canals deviate in the paratypes but have the same pattern).

Type Locality: The allotype, holotype, four female paratypes and eight male paratypes were collected by the author near PEPPERWOOD, HUMBOLDT CO., CALIFORNIA, August 12, 1950, in a redwood (*Sequoia sempervirens*) forest under boards and bark on the ground. One dead male was attached to the underside of a board by the mycelium of the fungus, *Torrubiella aranicida* Bond³. This fungus previously has been reported on spiders from France and Great Britain. The species is named after the sequoia trees which are prominent in the type locality.

The holotype and allotype will be deposited in the California Academy of Sciences. A male and female paratype will be deposited at the American Museum of Natural History and in the collection of Dr. R. V. Chamberlin at the University of Utah. A male paratype will be deposited in the collection of Mrs. D. L.

³ Identified by Paul L. Lentz of the U. S. Dept. of Agriculture, Beltsville, Md.

Frizzell (Harriet Exline) at Rolla, Mo. The remainder of the paratypes (6 ♂ ♂, 1 ♀) will be retained in the collection of the author.

Two paratypes were used for dissection and the following description and fig. 1 was taken from them. The internal epigynum consists of two separate and more or less identical halves. Each side consists of a long connecting canal which follows an irregular path as illustrated in fig. 1. Opposite to and slightly anterior to the connecting canal openings the connecting canal is swollen slightly and bears internally a dark colored globular mass similar to that found in the genitalia of some *Cybaeus*. A magnification of approximately 1,450 X indicates the presence of minute canals which ramify throughout the mass. The canal narrows abruptly posteriorly forming the fertilization duct which lies towards the median line.

Measurements in millimeters:

Total length 4.7. Average 3 ♂ ♂ 4.26. Range 3.8–4.7.

Carapace		Metatarsus	
length	2.24	I	1.67
width	1.63	IV	2.28
head width	.61		
eye width	.89	Tarsus	
Femur		I	1.19
I	2.11	IV	1.22
IV	2.21		
Tibia Patella		Total	
I	2.79	I	7.75
IV	2.99	IV	8.67

The curved process of the patella of the male will separate this species from previously known males. The pattern of the connecting canals of the female epigynum is distinct as illustrated.

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EDWIN C. VAN DYKE MEMORIAL ISSUE

With the death of Dr. Edwin C. Van Dyke on September 28, 1952, entomology and the Pacific Coast Entomological Society have lost one of the greatest pioneers. In tribute to his many accomplishments the January 1953 issue of the Pan-Pacific Entomologist will be devoted to his memory.—THE EDITORS.

NOTES ON FLIGHTS AND FOOD PLANTS OF PLEOCOMA

(Coleoptera: Scarabaeidae)

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During the third rain of the 1952 season (November 15), 26 males of *Pleocoma nitida* Linsley were collected close to the new Cross County Highway, 6 miles E. N. E. of Santa Margarita, San Luis Obispo County, California. As reported by Linsley (Pan Pacific Ent., 17:148, 1941), the probable food plants are *Adenostoma fasciculatum*, *Arctostaphylos* sp., and *Baccharis* sp. From my observations, the food plant probably is *Adenostoma*, possibly *Ceanothus*. The time of flight is similar to that of *P. conjungens* Horn (Hazeltnine, *ibid.*, 26:188-189, 1950), lasting from 4:55 p.m. to 5:25 p.m. in an intermittent light rain. The males of *P. nitida* are fast flyers and not attracted to lights.

Dr. J. A. Comstock (personal communication) reports that the males of *P. puncticollis* Rivers usually fly in the second or third rain and both day and night. After dark, the males are strongly attracted to light. The dominant vegetation is *Adenostoma* and *Ceanothus*, with the few larvae found apparently closer to the rootlets of *Ceanothus*.

While collecting November 14, 1952, on the Point Reyes Peninsula, Marin County, California (6 miles north of the light house gate), W. V. Garner and J. D. Lattin observed a flight of *P. sonomae* Linsley. This began about 2 p.m. and lasted about 15 minutes, the flight ending shortly after the start of precipitation. Thirty-seven males were collected during this flight. On November 16, 1952, J. D. Lattin dug out one male and one female in the same area and observed a male flying at sunset in clear, cool weather. The only food plant available to the female was the grass in the area. This association is similar to that of *P. hirticollis vandykei* Linsley in the Patterson Pass area, where the larvae have been taken feeding on grass roots (Ritcher, *ibid.*, 23:11, 1950).

F. Beer (personal communication) reports both sexes of *P. dubitalis leachi* Linsley collected in an area of *Pseudotsuga taxifolia*.

It would appear that the males of the seven lamellate group (Linsley, *ibid.*, 22:61-64, 1946) are crepuscular flyers during precipitation while the five lamellate males fly almost any time and under a wider range of climatic conditions.

BIOLOGY AND METAMORPHOSIS OF SOME SOLOMON
ISLANDS DIPTERA. PART II: SOLVA BERGI JAMES
(ERINNIDAE), WITH A COMPARISON OF
RELATED SPECIES*

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The general introduction to a proposed series of papers on biology and metamorphosis of some Diptera reared in the Solomon Islands during World War II is given in a previous paper (Berg, 1947). This second paper of the series concerns a species of Erinnidae, *Solva bergi*, recently described by Dr. Maurice T. James (1951) from specimens collected and reared by the author.

I am indebted to Dr. James, of Washington State College, for preparing the original description of *S. bergi*. Four larvae and puparia of *S. pallipes* (Loew), which proved valuable for comparative studies, were furnished by Dr. Alvah Peterson, of Ohio State University. A grant-in-aid from Ohio Wesleyan University enabled me to employ Mr. C. R. Roelofs, Jr., student at Ohio Wesleyan, who gave excellent assistance in the preparation of illustrations.

To ensure accuracy of proportions, tracings of micro-projector images were used as bases of all drawings. Larvae, puparia, pupae and adults of *S. bergi* are deposited at the United States National Museum for the convenience of future investigators.

Adults of *Solva bergi* were frequently observed resting on leaves of jungle undergrowth near the Tenaru River about one and one-half miles from the north coast of Guadalcanal. Their conspicuous black and yellow coloring and their habit of resting on the upper surfaces of leaves render them easily seen. All were in moist, shaded situations. Although they often flew when disturbed, they were captured readily in a net, and ten females and five males were collected in this way from September through December, 1944. Mating, oviposition and food habits of the adults were not observed.

On April 11, 1945, more than sixty larvae of this species were found in the moist, spongy, fermenting bark of a branch lying on the bank of the Tenaru River about two miles from its mouth. A

* Based upon rearing and biological observations made on Guadalcanal Island during 1944 and 1945, while on active duty in a Malaria Control unit of the United States Navy. The statements and opinions set forth are the author's and not necessarily those of the Navy Department.

variety of dipterous larvae lived in this sour smelling bark, feeding on it, on the fungus which it supported or on other larvae living in this material. Malloch, who found the larvae of *S. pallipes* under similar conditions, wrote (1917:342), "The *Xylomyia* [*S. pallipes*] larvae were found to be predaceous, feeding indiscriminately upon the other larvae." While it seems likely that larvae of *S. bergi* are also predaceous, observations in support of this suggestion are lacking. Other flies reared from this collection represent the families Chloropidae, Dolichopodidae, Mycetophilidae, Neriidae, Psychodidae, Stratiomyidae (four species) and Syrphidae.

The pulpy bark became progressively more liquid and more malodorous as it continued to ferment and decompose in the laboratory. It was finally reduced to a mass of dissociated fibers suspended in a thick, dark brown liquid, which was frequently decanted off to avoid the possibility of toxic effects upon, or asphyxiation of, the larvae.

Larvae of *S. bergi* move about relatively little. They made no attempt to leave the culture medium before pupation. Pupation occurs within the puparium (fig. 7), the leathery integument of the last stage larva, which undergoes no conspicuous change in shape such as that observed during formation of the puparia of *Cyclorrhapha*. Two or three days after cessation of larval movement, the outline of the pupa can be seen when light is transmitted through the puparium. A specimen thus observed as a pupa within the puparium on April 25 emerged as an adult seven days later.

Before emergence, each puparium splits along the mid-dorsal line throughout the mesothoracic, metathoracic and first abdominal segments, and more than half way back through the second abdominal segment (fig. 1). A transverse cleft between dorsal surfaces of the prothorax and mesothorax intersects the longitudinal slit and in some specimens extends around on the ventral side, detaching head and prothorax from the rest of the puparium¹.

The pupa works its way forward and upward through the longitudinal emergence slit until the head, thorax and first four abdominal segments are out of the puparium. Usually it stops in this position, with fifth abdominal segment in the emergence slit and sixth and seventh segments still within the puparium. This pupal

¹ It is evident from the description that the single specimen from which Townsend described the *S. pallipes* puparium (1893:164) lacked not only the head, as he stated, but also the prothoracic segment.

integument ruptures dorsally to produce a Y-shaped opening across the head and thorax, and the adult emerges, leaving the pupal exuvia loosely clasped in the puparium (fig. 6). A few pupae emerge completely from the puparium before yielding the adult fly (fig. 8).

Emergence requires several minutes. The emergence slit was noticed in a puparium at 11:20 a.m. At 11:25, the pupa was wriggling out. There were intervals of slow to moderate activity and intervals of rest. By 11:35, all but the last three segments of the pupa had emerged. Although it continued to move at intervals for the next ten minutes, it made no further progress. After an interruption of one hour in my observations, I found the adult fly emerged and active. The pupal exuvia was completely free from the puparium.

Twenty-four males and 35 females were reared from the collection made on April 11. Emergence began with a single specimen on April 30 and rapidly rose to a peak of 16 specimens on May 5.

A few additional specimens of *S. bergi* were reared from larvae found beneath moist bark of a fallen tree on April 19, 1945. This collection was also made on the bank of the Tenaru River, about one-half mile downstream from the April 11 collection, and the *S. bergi* larvae were again associated with larvae of several other species.

DESCRIPTION OF PUPARIUM

The known larvae of *Solva* and *Xylomyia* (as recognized by Steyskal, 1947) are broad and flat, distinctly segmented, composed of head, three thoracic and eight abdominal segments. They differ markedly from the elongate, subcylindrical, soft-bodied larvae of *Erinna* (= *Xylophagus*) and other genera of Erinnidae, but they resemble Stratiomyidae larvae very closely. Like them, larvae of *Solva* and *Xylomyia* have leathery, thick integuments, which effervesce strongly when placed in dilute hydrochloric acid, apparently because they are covered or inlaid with calcareous deposits². Lundbeck (1907:79) wrote that the *Xylomyia* calcareous bodies are flat, superficial plates, in contrast to the nail-shaped processes of Stratiomyidae larvae. Considering larval characteristics, it is not at all strange that many investigators have regarded the species now referred to *Solva* and *Xylomyia* as constituting a sub-family of Stratiomyidae³.

²Such treatment with a dilute acid is an important step in cleaning these puparia before mounting them for study.

The problem of identifying larvae of these two genera is primarily one of distinguishing them from Stratiomyidae larvae and from each other. In order to determine which of the anatomical features observed in *S. bergi* occur also in other species of *Solva*, comparisons were made throughout this study with larvae and puparia of *S. pallipes* (Loew). Published descriptions and figures of larvae of three other species of *Solva* and *Xylomyia* were used in attempting to select characters which they possess in common and which distinguish them from all Stratiomyidae larvae. These species are *Solva marginata* Meigen, *Xylomyia maculata* (Meigen) and *X. varia* (Meigen).

Since the integument of the last stage larva is not altered in shape when pupation occurs within it, and since emergence finally leaves this integument more clear and more easily studied than is the larva, most descriptions of *Solva* and *Xylomyia* larvae are based upon this empty larval skin or puparium.

The puparium of *S. bergi* (fig. 7) measures $2.0 - 2.8 \times 7.4 - 9.2$ mm. The larval integument is inlaid with small plates or scales which give it an appearance not unlike that of pebbled leather (fig. 9). Some of these scales are distinctly darker than others, and the pigmented ones are distributed in patterns which are fairly constant and characteristic (figs. 1, 2, 3).

Conspicuous smooth, clear areas, in which the small scales and the reticulated, shagreened appearance of the integument produced by them do not occur, are found on both prothorax and mesothorax of *S. bergi*. Single, large, median clear areas occur on dorsal surfaces of both segments (fig. 1), while on the ventral surfaces three clear areas are found on the prothorax, and two on the mesothorax (fig. 2).

Malloch (1917:317), who regarded the "Xylomyiinae" as a subfamily in Stratiomyidae, used: "Thoracic segments 1 and 2 each with a smooth plate on dorsum," as a key character to distinguish these larvae from those of other subfamilies of Stratiomyidae. Unfortunately, he confused this situation by mentioning in his

³Although Séguy (1926: 81) placed these species in Erinnidae, he divided this family into Xylomyiinae, all known larvae of which are the flat, stiff-bodied type herein discussed, and Erinninae, larvae of which have elongated, subcylindrical bodies covered with thin, flexible integuments. This division, based upon adult characters, tends to support the conclusion inevitably reached by students of life cycles and immature stages, that the family Erinnidae includes two remotely separated phylogenetic groups.

description of *S. pallipes* (p. 342), "a pair of narrow transverse plates on dorsum of metathorax," where he undoubtedly meant to write, "mesothorax." As illustrated by Peterson (1951: fig. D 13: B), the paired, transverse clear areas on dorsum of mesothorax of *S. pallipes* almost touch each other at the mid-dorsal line. In addition, *S. pallipes* larvae have single, median clear areas on both dorsum and venter of the prothorax, but none occur on the metathorax nor on venter of mesothorax.

Although the failure of European authors to mention anything as conspicuous as these features would seem to indicate that they do not occur on *S. marginata*, *X. maculata* and *X. varia*, such a conclusion should not be adopted until the larvae in question have been reexamined. These clear areas may characterize larvae of all species of *Solva*. If *Xylomyia* larvae also possess them, the character may prove valid for distinguishing larvae of these two genera from all Stratiomyidae larvae. Differences in number, form and distribution of these areas seem to be valuable in specific identification. It is the most conspicuous and least variable trait found to distinguish larvae of *S. bergi* from those of *S. pallipes*.

Mesially, on venters of abdominal segments five and six, larvae of both *S. bergi* and *S. pallipes* have small, oval areas of noticeably lighter integument (fig. 9). While the clear areas on the thorax have no scales and appear quite homogeneous, the abdominal light areas have small, pale integumentary scales.

On the ventral surface, there is a transverse row of small, blunt spicules near the anterior margin of each of the first seven abdominal segments of *S. bergi* (fig. 9). The venter of each of the first six abdominal segments has a single, continuous row, usually made up of 17–19 spicules. On the seventh segment, the row is interrupted mesially and is composed of only eight or nine minute, poorly developed spicules. On the dorsal surface, abdominal segments two through seven bear rows of larger, fewer spicules near their anterior margins (fig. 1). The dorsum of the seventh abdominal segment usually has 10 or 11 spicules, and each of the others characteristically has 12–14.

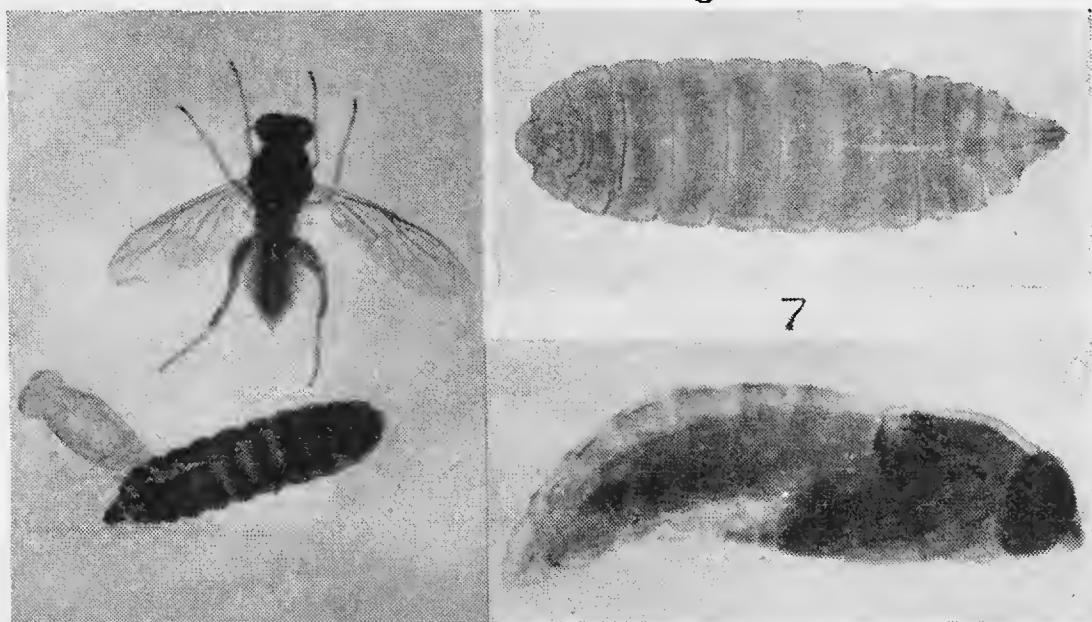
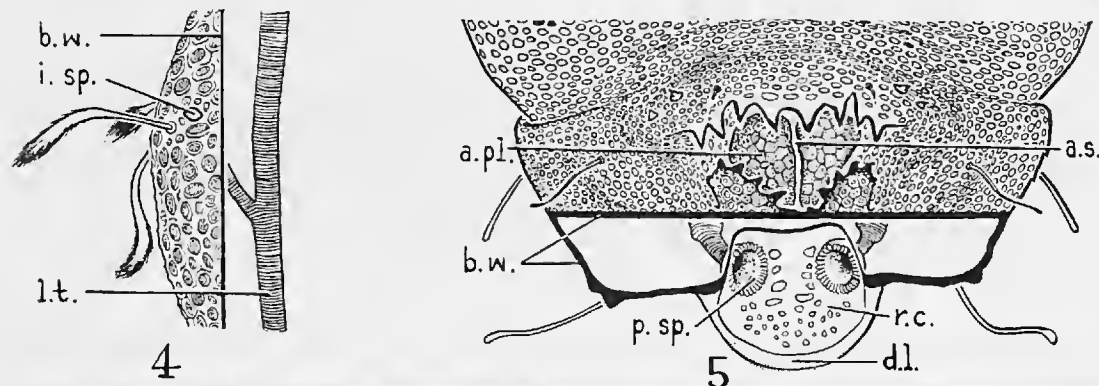
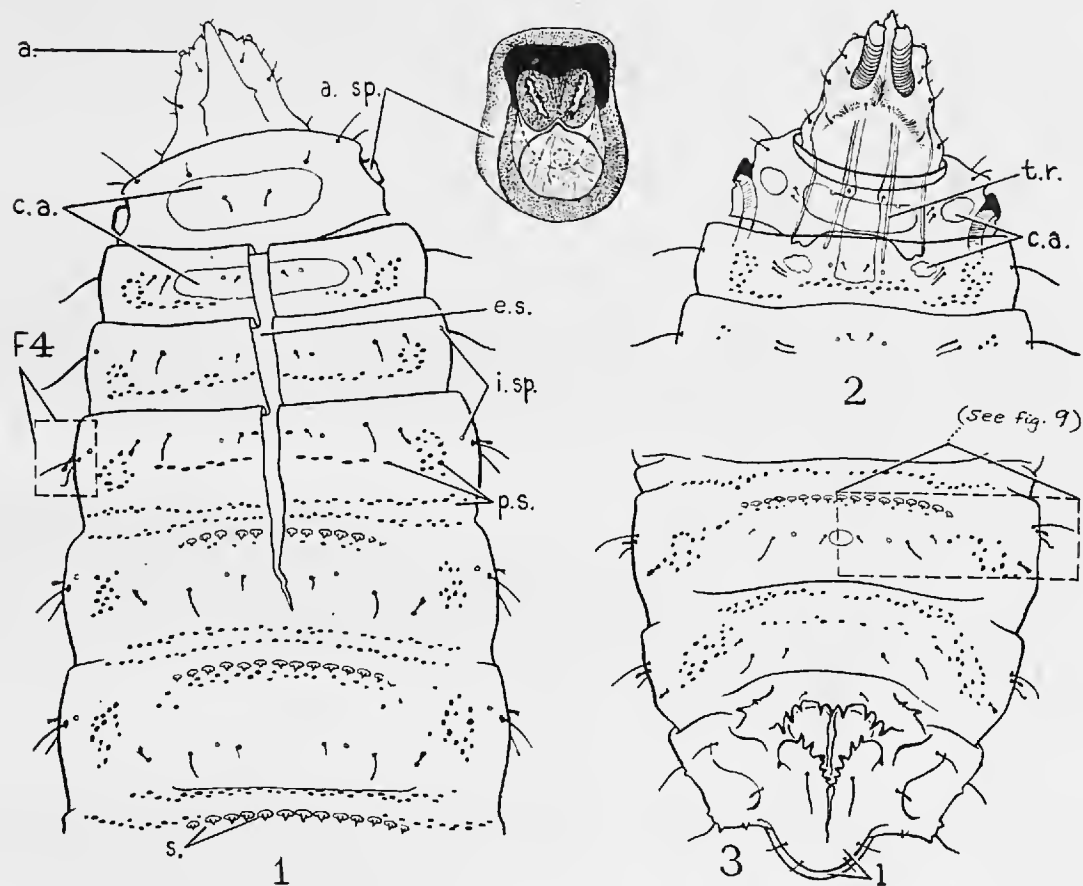
Slightly smaller numbers of spicules occur on abdominal segments two through six of *S. pallipes*. Each has 13–17 on the venter and 8–11 on the dorsum. There is a row of small, rudimentary spicules on the ventral surface of the first abdominal segment. None occur on the seventh abdominal segment.

It is evident that larvae of all species considered here bear these rows of abdominal spicules on one or both surfaces of some abdominal segments. Austen (1899:185) wrote that, while other investigators had reported these structures on *S. pallipes*, *S. marginata* and *X. varia*, they do not occur on the larva which he was then describing, *X. maculata*. However, Lundbeck (1907:80) pointed out that, "On the anterior margin of some of the ventral segments there is a transverse row of small warts," and Séguy (1926: fig. 222) illustrated these spicules in a ventral view of the *X. maculata* larva.

Anterior spiracles (fig. 1) are conspicuous on the first body (prothoracic) segment of both *S. bergi* and *S. pallipes*. The lateral face view of each spiracular plate shows two oblique slits in the anterior half and what may be a third opening behind them. So many lines appear in so many levels in the posterior half of this spiracular plate that it is very difficult to interpret. The large circular area apparently regarded as a hole by both Malloch (1917: Pl. 48, fig. 9) and Greene (1926: fig. 1:a) is a structure sculptured superficially with fine lines in both *S. bergi* and *S. pallipes*. This appears to be a thin, leaf like shield, attached anteriorly near the two oblique slits. A smaller circle, seen in slightly deeper focus within the larger one, may be the rim of a hole, the third opening into the spiracular plate. Still deeper, an inner rim of the heavily

METAMORPHOSIS AND IMMATURE STAGES OF *Solva bergi*

Fig. 1. Head and first six body segments of empty puparium in dorsal view, with lateral face of anterior spiracle enlarged at right. *a.*, antenna; *a. sp.*, anterior spiracle; *c. a.*, clear areas lacking integumentary scales; *e. s.*, emergence slit; *F. 4.*, area enlarged in Figure 4; *i. sp.*, intermediate spiracles; *p. s.*, pigmented scales; *s.*, spicules. Fig. 2. Head and first two body segments of cleared puparium, with tracheal trunks and posteriorly projecting skeleton of head showing through ventral body wall. *c. a.*, clear areas; *t. r.*, tectorial rods. Fig. 3. Ventral view of last three segments of puparium. *l.*, lips of respiratory chamber; (see area enlarged in Figure 9). Fig. 4. Enlarged lateral margin of first abdominal segment, with dorsal body wall cut away to show main tracheae. *b. w.*, cut edge of body wall; *i. sp.*, intermediate spiracle; *l. t.*, longitudinal tracheal trunk. Fig. 5. Ventral view of eighth abdominal segment, with portion of ventral body wall and ventral lip and ventral wall of respiratory chamber removed. *a. pl.*, anal plate; *a. s.*, anal slit; *b. w.*, cut edge of body wall; *d. l.*, dorsal lip of respiratory chamber; *p. sp.*, posterior spiracle; *r. c.*, dorsal integument of respiratory chamber. Fig. 6. Adult fly and exuviae of larva and pupa, showing how the latter usually remains in emergence slit of puparium. Fig. 7. Empty puparium, viewed with transmitted light. Fig. 8. Lateral view of pupa.



6

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sclerotized spiracular wall is clearly evident, and behind that the spirally thickened tracheal trunk can be seen running back into the body.

Posterior spiracles (fig. 5) open through the dorsal wall of the respiratory chamber in the last (eighth abdominal) segment. These flared, bell-shaped spiracles have broad, nearly circular rims or peritremes partitioned off by radiating rods into 26–31 equal sections. Grossly, the posterior spiracles and respiratory chamber of *S. pallipes* appear very similar to those of *S. bergi*, but the former have peritremes made up of 32–39 little sections.

The respiratory chamber, walls of which are sparsely supplied with sclerotized scales, opens to the outside by means of a terminal, transverse slit between conspicuous dorsal and ventral lips (fig. 3). When the whole puparium of either *S. bergi* or *S. pallipes* is examined with transmitted light, these lips and the area of the respiratory chamber appear darker and quite distinct from the rest of the segment (fig. 7). Several authors (e.g. Brauer, 1883: 23; Malloch, 1917: 342) have pointed out how much this area appears like an additional segment, and two (Townsend, 1893: 164; Lundbeck, 1907: 79) seem actually to have mistaken it for a diminutive twelfth body segment. Brauer, who regarded the species now referred to *Solva* and *Xylomyia* as *Subula* spp., Stratiomyidae, proposed what appears to be a valid key character for distinguishing these larvae from those of all other genera of Stratiomyidae. He wrote (1883: 23), "Letzter Ring halbrund, abgestutzt, . . . hinten mit deutlich segmentartig abgesetzten Lippen der queren Stigmen-spalte." Sharp's character (1909: 35), that the orifice of the respiratory chamber is terminal, "looking backwards," is less valuable, since this condition also exists in larvae of the Stratiomyinae.

Intermediate spiracles are not easily seen. Sharp wrote categorically that larvae of this group are amphipneustic, and Austen (1899: 188) emphasized their apparent lack of intermediate spiracles as a means of distinguishing them from larvae of Stratiomyidae. While Lundbeck detected small and indistinct spiracular plates on the first seven abdominal segments (presumably of *X. maculata*), he wrote (1907: 80), "these spiracles are certainly not in function." Inconspicuous spiracles were found near lateral margins of the metathoracic as well as the first seven abdominal segments of both *S. bergi* and *S. pallipes* (fig. 1). Tracheal branches connect these spiracles with the longitudinal tracheal trunks (fig. 4), but

no experimental evidence of function or lack of function was obtained.

The head of *S. bergi* is bluntly conical, with small antennae at the anterolateral corners and with bristles distributed as shown (figs. 1, 2). Parts of the cephalic skeleton which protrude back into the thorax are shown in figure 2. Bischoff (1924: 5), who treated this group as Stratiomyidae: *Subula*, mentioned the occurrence of well developed, wholly sclerotized tectorial rods as a character to distinguish the larvae from those of the (other) Stratiomyidae. These structures are well developed and completely sclerotized in both *S. bergi* and *S. pallipes*.

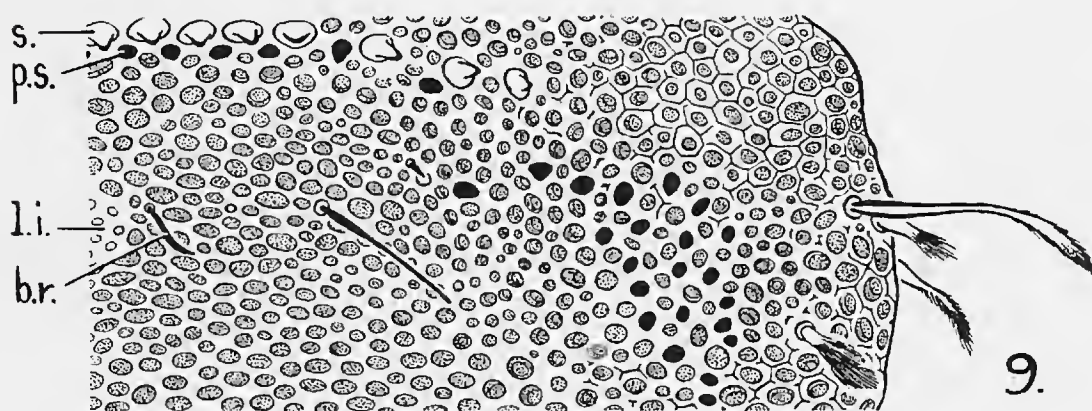


Fig. 9. Enlarged left half (approximately) of sixth abdominal segment of puparium in ventral view. br., bristle; l. i., oval area of light integument; p. s., pigmented scale; s., spicule.

The last segment of the *S. bergi* puparium bears the anus ventrally as a median longitudinal slit, surrounded by short spines or denticles which point in several directions (fig. 5). Malloch (1917: 317) used the conspicuous denticles just anterior to the anal slit to distinguish these larvae from those of the Stratiomyidae. This seems to be a valid character, but it should be noted that the "transverse series of short teeth" is in some species often broken into a median and two lateral portions, the latter extending more obliquely than transversely (fig. 3; Séguy, 1926: fig. 220). Contrasting the number, positions, sizes and directions of denticles illustrated in Figure 3 with those in Figure 5 shows considerable variation in these structures among different specimens of *S. bergi*. With respect to this character, there is greater similarity between some *S. pallipes* larvae and Figure 5 than there is between the specimens of *S. bergi* from which Figures 3 and 5 were drawn.

Each body segment, except the first and the last, of both

S. bergi and *S. pallipes* bears three pairs of bristles dorsally and three pairs ventrally, well removed from the lateral margins. Some of these (e.g. the most lateral pair on ventral surfaces of abdominal segments) are minute and difficult to find. Most of the marginal bristles of my specimens of *S. pallipes* are broken off. Those still present correspond approximately in size and position with those of *S. bergi*.

On the puparium of *S. bergi*, two bristles occur near each lateral margin of the prothorax, one on each margin of mesothorax and metathorax, and four bristles are found at or near each lateral edge of abdominal segments one through seven (fig. 9; figs. 1-4). Three of these four are attached slightly ventral to the margin, and the posterior one is so short that it does not project beyond the lateral edge. The three that do project shift relative positions somewhat on the various segments. On the anterior abdominal segments, the shortest bristle is anterior to the two long ones, the bases of which are directly above and below one another (fig. 4). On posterior segments, the long ventral bristle is anterior to all others. All of these marginal bristles appear plumose near their tips when magnified 60 diameters or more (fig. 9).

Bristles on the thorax of *S. bergi* are distributed as shown (figs. 1, 2). Those on the venter of the terminal segment are depicted in fig. 3. Dorsally, this segment has three large tubercles in a transverse row near the anterior margin and bears a single plumose bristle just anterior to each end of the lips of the respiratory chamber.

DESCRIPTION OF PUPA

Pupae of all five species considered here emerge partly or completely from the puparia before yielding adult flies. This contrasts with emergence of all reared Stratiomyidae, adults of which escape directly from the puparia, leaving pupal exuviae completely enclosed.

Mature pupa of *S. bergi* (fig. 8) apparently very similar to that of *S. pallipes*; covered by a thin, yellow, transparent integument, through which color markings and bristles of enclosed adult are distinctly visible. Length 5.2-6.5 mm.; greatest width of head (to tips of antenna cases) 1.4 mm.; maximum width of thorax (including wing pads) 1.7-1.75 mm.; widest abdominal segments 1.43-1.5 mm. Antenna cases large, pointing laterally, annulated to their tips. Thorax slightly deeper dorsoventrally (1.5 mm.) than long (1.4 mm.). Wing cases usually reaching middle of third abdominal segment; a few extending to its apex. Cases of metathoracic legs reaching approximately to apex of fourth abdominal segment. Prothoracic

spiracles shaped as illustrated (fig. 1-d) by Greene, situated on small elevations on anterolateral margins of thorax. Other thoracic spiracles described by Townsend not apparent on either cleared pupae or pupal exuviae. Abdomen cylindrical, composed of eight segments. First and last segments without bristles; all segments bare on ventral surfaces. Segments 2-7 each with a transverse row of appressed, yellow, spinelike bristles, just posterior to middle of segment, directed posteriorly. Each long bristle surrounded at base by several shorter ones, the whole group attached to a single tubercle. Segments 1-7 with small, slightly elevated spiracles on lateral surfaces anterior to middle of segment⁴. Apex of last segment distinctly bilobed laterally in both sexes.

SUMMARY

Adults of both sexes of *Solva bergi* were taken in nets from September through December, 1944, as they rested on jungle undergrowth near the north coast of Guadalcanal Island.

Two groups of *S. bergi* larvae were collected in April, 1945, associated with dipterous larvae of several other species, in and beneath the moist, fermenting bark of fallen timber. Adults were reared from both collections.

Anatomical features of larvae, puparia and pupae of *S. bergi* are described with the aid of nine figures. To determine which of these features occur also in other species of *Solva*, comparisons were made with larvae and puparia of *S. pallipes*.

Larvae of *Solva* and *Xylomyia* differ markedly from those of other Erinnidae, but they resemble Stratiomyidae larvae very closely. Published figures and descriptions of *S. marginata*, *Xylomyia maculata* and *X. varia* larvae were consulted to find valid characters for distinguishing them and the two species examined from all Stratiomyidae larvae. The following traits, all common to *S. bergi* and *S. pallipes* and some reported also for other species of *Solva* and *Xylomyia*, may prove valuable in identifying immature stages of these two genera.

1. On thoracic segments one and two, larvae of *S. bergi* and *S. pallipes* have conspicuous smooth, clear areas, the number and distribution of which provide an excellent means of distinguishing these two species. These scaleless areas, unfortunately not mentioned by most European

⁴ Lack of elongated respiratory processes which protrude through holes in the puparia may distinguish these pupae from those of the Stratiomyidae which have terrestrial larvae. Although they have escaped the notice of nearly all investigators, tubular respiratory processes such as those which thrust out through puparial integuments of all terrestrial Stratiomyidae reared by the author may occur generally on terrestrial pupae in this family. Protruding dorsolaterally near each spiracle on the first few abdominal segments, these structures would seem to anchor the pupae so effectively as to prevent their emergence.

- authors, may either characterize larvae of the genus *Solva* or help to distinguish *Solva* and *Xylomyia* from all Stratiomyidae larvae.
2. Transverse rows of small, blunt spicules occur on one or both surfaces of most abdominal segments of *S. bergi*, *S. pallipes*, *S. marginata*, *X. varia* and *X. maculata*. Differences in numbers of spicules are useful in specific identification.
 3. *S. bergi* and *S. pallipes* larvae have anterior, posterior and intermediate spiracles similar to those of Stratiomyidae, but the prominent lips of their posterior respiratory chambers are quite distinct. Terminal segments of all known larvae of *Solva* and *Xylomyia* have peculiarly interrupted outlines, with the protruding lips of the respiratory chamber appearing like an additional segment.
 4. The cephalic skeletons which extend back into the thorax of *S. bergi* and *S. pallipes* larvae include well developed, wholly sclerotized tectorial rods.
 5. A transverse series of short denticles (sometimes broken into a median transverse and lateral oblique portions) occurs just anterior to the anal slit on all *Solva* and *Xylomyia* larvae considered here.
 6. Pupae of all reared species of *Solva* and *Xylomyia* emerge partly or completely from the puparia before the pupal integuments rupture to yield adult flies.
 7. Pupae of *Solva* and *Xylomyia* differ from those of most terrestrial Stratiomyidae in lacking tubular, protruding respiratory processes.

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A NEW GENUS AND SPECIES OF APHIDAE ON SCOTCH BROOM IN OREGON

(Homoptera)

E. O. ESSIG

University of California, Berkeley

Gentnera Essig, new genus

(Figures 1-2)

Body elongate with small acorn-like tubercles on the head and body of the alates and on the head of the apterae; body tubercles on aptera finger-like, short anteriorly and gradually lengthening posteriorly and arranged in 2 pairs on the prothorax, 2 small pairs and 2 larger pairs on mesothorax and 2 pairs on the mesothorax and all abdominal segments, excepting the last which has a single pair. The marginal tubercles longer. The pair supporting the cornicles in the alate are not greater than the others, but in the aptera they are much reduced in length. Antennae 6-segmented; slightly longer than half the length of the body; with elongate or oval secondary sensoria; unguis slightly more than half the length of the base; imbricated and with very short hairs. Compound eyes normal, with basal tubercle. Rostrum extends nearly to the second coxae, rather blunt. Legs short. Wings normal aphid-type excepting the media which is vestigial or absent, and the cubitus of the hind wings may be absent or present. The hamuli consist of but 2 acutely curved hooks. Cornicles very small—almost pore-like, situated on the base of abdominal marginal tubercles VI. Anal plate bilobed and with few hairs. Cauda knobbed with wide base and few hairs.

Body tubercles on alate parthenogenetic female and on alate male acorn-like. Secondary sensoria occur on antennal segment III of alate and apterous

parthenogenetic females and on segments III–VI of the alate male. Other characters may be noted in the accompanying illustrations.

This genus somewhat resembles *Anomalaphis* Essig but differs in having many less body tubercles which lack terminal setae and have much reduced and differently shaped cornicles.

Type species: *Gentnera oregona* new species.

Gentnera oregona Essig, new species

(Figures 1–2)

TYPE: *Alate parthenogenetic female* (Fig. 1).—Small, black and yellowish- or greenish-gray with 2 marginal rows of dark pigmented areas at the bases of the lateral abdominal tubercles and 2 rows of larger transverse pigmented areas on the dorsum of the abdomen; head, thorax and appendages dusky to black. The pigmented areas may be finely imbricated. Front of head with 2 short tubercles each tipped with a small capitate seta. Antennal segment I large, rugose and with several inconspicuous hairs. Other segments as figured. Segment III with 7–9 oval secondary sensoria. Rostrum as drawn; extends nearly to 2nd coxae; has few short hairs. Forewings with aphis-type venation, but the radial sector represented only by a vestigial apical pattern. Hind wings small with normal venation as illustrated. The hamuli consist of 2 acutely curved hooks. Legs rather small with short hairs. Cornicles small, truncate, broader than long; situated at the bases of lateral tubercles. Genital plate oval with many fine short hairs. Anal plate bifurcate and with 2 long curved bristles and a few short hairs. Cauda knobbed with wide base; with 2 long and several smaller spines.

Length of body 1.20 mm.; antennae 0.80 mm.; wing 1.50 mm.; hind tibiae 0.50 mm.; cauda 0.10 mm.

Apterous parthenogenetic female.—Body narrowly elongate, grayish or dusky because of many transverse dark broken bands; dusky antennae and legs. The pair of tubercles on vertex more prominent than in the alate. Many conspicuous finger-like tubercles, colorless, imbricated and devoid of spines and setae. Three pairs of small dorsal tubercles on head, 1 median pair on pronotum and 2 pairs on metanotum acorn-shaped, whereas all other tubercles are arranged in a double series down middle and along each lateral margin as figured. There are 12 pairs counting the apical 2 pairs on segment VII. Antennae short, 6-segmented; nearly circular secondary sensoria present on segment III in the following combinations on various individuals: 1–2, 2–2, 2–3, 3–4, 4–0, 4–4, and 4–5. Legs short and rather stout. Rostrum much as in alate; cornicles somewhat broader than in alate. Anal plate and cauda much the same as in the alate. Length of body 1.50 mm.; width 0.60 mm.; antennae 0.80 mm.; hind tibia 0.45 mm.; longest body tubercle on segment V 0.20 mm.; shortest segment VI bears the cornicles.

Apterous oviparous female.—Similar to apterous parthenogenetic female, differing by being smaller and in having fewer secondary sensoria on antennal segment III, distributed in the following combinations per individual (number of individuals in paranthesis): 0–3 (1), 1–2 (3), 2–2 (3), 2–3 (7), 2–4 (3), 2–5 (1), 3–3 (7), 3–4 (2), 3–5 (1), 4–4 (1), 4–5 (1), 4–6 (1), representing a total of 31 specimens. Hind femora thickened and bears about

20 sexual sensoria of different sizes, the number variable and the sensoria quite often rather indefinite and indistinct. Head tubercles may project forwards in immature forms. Length of body 1.40 mm.; width 0.55 mm.; length of antennae 0.60 mm.; hind tibiae 0.40 mm.; cauda 0.10 mm.

Male: alate; somewhat smaller than alate parthenogenetic female, coloration much the same. Wing venation also after the same pattern with radial sector of forewings rudimentary or absent and cubitus of hind wings present or absent; in general aspects and color pattern quite like that of alate parthenogenetic female. Cauda, anal plate and sexual organs as illustrated. Secondary circular sensoria occur on all antennal segments excepting I and II. For 16 individuals they were distributed according to the following pattern (the number in parenthesis represents the number of specimens ex-

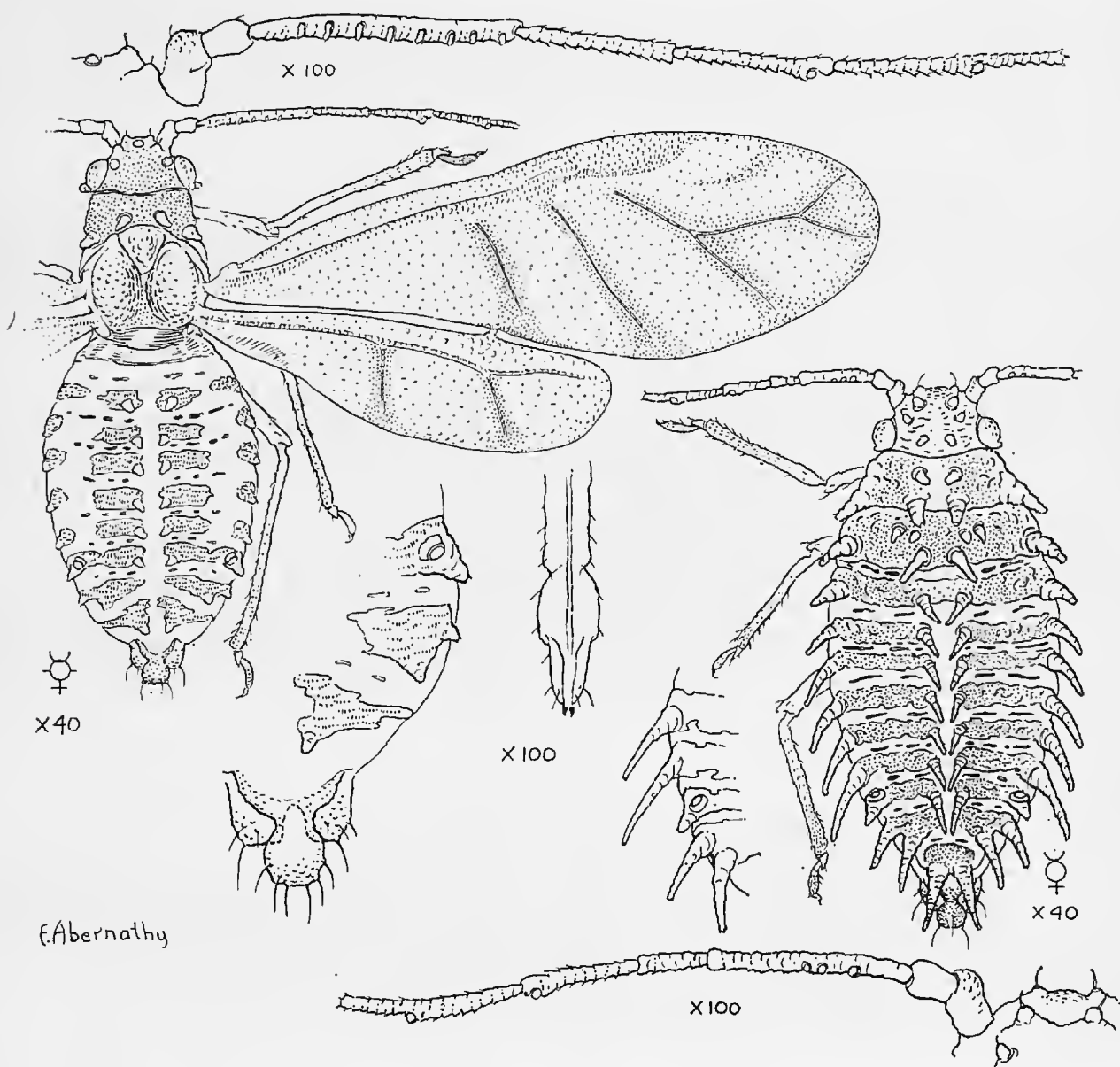


Fig. 1. *Gentnera oregona* Essig, n. sp. Alate and apterous parthenogenetic females together with enlargements of the antennae, rostrum, a portion of the abdomen, and the anal plate and cauda, rostrum, portion of abdominal margin of segments IV–VIII showing tubercles and cornicle, and antenna and front of the apterous form. Enlargements indicated. (Drawings by Frieda Abernathy.)

amined): **III**: 8-x (1), 9-12 (1), 10-10 (2), 10-11 (5), 10-13 (1), 11-11 (4), 11-12 (2); **IV**: 0-2 (1), 1-1 (7), 1-2 (4), 2-x (2), 2-3 (1), 3-3 (1); **V**: 1-x (2), 1-2 (6), 2-2 (4), 2-3 (1), 2-4 (1), 3-x (1), 3-3 (1); **VI**: 1-1 (3), 1-2 (4), 1-3 (2), 2-2 (5), 2-3 (2). (x indicates the other member was missing or hidden).

Paratypes show the following variations: secondary sensoria on antennal segment III vary in combinations per individual as follows: 7-8, 9-9, 12-13.

In the venation of the primary wings the radial sector may be completely absent or represented by an apical remnant. In no case noted was the vein complete. In the hind wings the media was present in all specimens but the cubitas was absent in 13 individual wings and present in 21 (males and alate parthenogenetic females).

Type—The type is an alate parthenogenetic female—mounted on a slide with a number of apterae and young. All the other specimens are designated as paratypes.

The collection studied consists of 244 adults and a number of young mounted on 28 slides.

Host Plant and History: This very interesting species was first collected on seedlings of "English broom" in his garden at Medford, Oregon, July 24, 1951, by L. G. Gentner, Entomologist and Assistant Superintendent of the Southern Oregon Branch Experiment Station, Medford, Oregon. He stated that "young plants were practically defoliated." This first lot consisted of alate and apterous parthenogenetic females in all stages of development. The specimens were so interesting and so different from any species heretofore collected in western North America that a great effort was made to find their origin. I immediately informed Mr. Gentner of his find and requested more information regarding all possible host plants and distribution. During the remainder of the year Mr. Gentner made more extensive collections and observations. He secured the sexual males and females, but could find them on no other hosts than the "English hybrids of Scotch Broom, *Cytisus scoparius* L." which his wife was growing in the garden. These seedlings were about 18 inches high and were considerably injured by the aphids. An examination of the surrounding country revealed no additional infestations. In October, Mr. Gentner visited the Moyer's Nursery, near Roseburg, Oregon from which the original plants had been obtained. "There

was only one shrub of this broom left, and I could find no aphid infestation." In summing up the situation Mr. Gentner wrote me (Sept. 17, 1951) as follows: "I haven't the least idea where this species could have originated but shall make an effort to determine other host plants and other infestations if possible."

The genus is named for L. G. Gentner, Entomologist of Oregon State College, who discovered and collected this and other interesting new species of aphids.

Since writing this paper the writer has received from F. L. Blanc, Bureau of Entomology, California State Department of Agriculture, a few specimens of this species collected by D. Zuckswert on the leaves of Scotch broom at Stockton, California, June 4, 1952. It would appear from this that the species may be quite widely distributed.

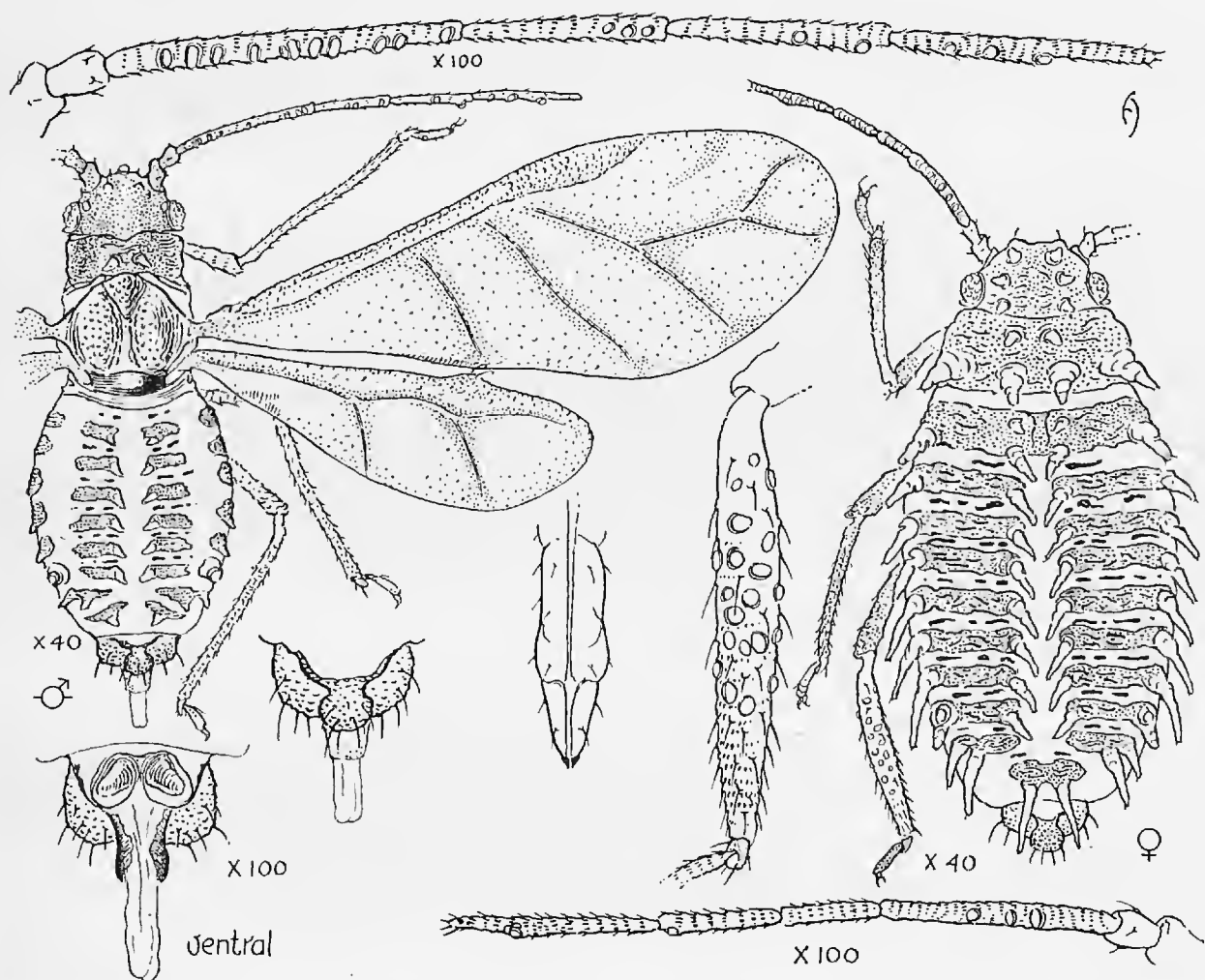


Fig. 2. *Gentnera oregona* Essig n. sp. Alate sexual male and apterous oviparous female with enlargements of the antenna, cauda and sexual organs of the male and the rostrum, hind tibia showing sexual sensoria, and the antenna of the female. Enlargements indicated. Drawings by Frieda Abernathy.)

A LECTOTYPE DESIGNATION IN THE GENUS EULONCHUS

(Diptera: Acroceridae)

EVERT I. SCHLINGER

University of California, Davis

Through the courtesy of Professor Dr. Fritz Peus of the Zoologisches Museum of Berlin, Germany, I was able to borrow for examination one of the two type specimens (cotypes) of *Eulonchus smaragdinus* Gertaeker. This specimen, a male, collected by von Müller in California, bears the following labels: a green locality and collector label; a red "Type" label; a white label with the number "1251"; a green label with "smaragdinus Gerst.*", and a second green label with the locality and collector. According to correspondence received from Prof. Dr. Peus, the other cotype in the Zoologisches Museum also has a red "Type" label.

In comparing the specimen on hand with the original description (Stett. Ent. Zeit., XVII:360-361, 1856), it was found to differ only in its general coloration, being more nearly metallic blue than bright emerald green. It was also interesting to note that each antenna had one apical seta, a character which was not mentioned by Gerstaecker, but rather was first discussed as a character of this species by Sabrosky (Amer. Mid. Nat., 39:388, 1948). The specimen is in perfect condition except for the missing apical half of the right middle leg and a somewhat deflated lower corner of the left eye.

Since no information has been found on the type designation of this species, this specimen is hereby designated as the lectotype of *Eulonchus smaragdinus* Gerstaecker.

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ERRATA, Volume XXVIII

- p. 24, last line should read: couplet 9 in the key to the species of *Ameletus* given by Traver on p. 447 of *The Biology of Mayflies*, and *A. facilis*, n. sp. is closely related to . . .
- p. 28, for Fig. 4 *P. genitalia*, read Fig. 4 *P. clara*, genitalia . . .
- p. 72, and subsequent verso pages through 124, as well as in separates and reprints therefrom: read Vol. XXVIII for Vol. XXIII, in the running head.
- p. 75, in paragraph 1, the scientific names of the California nutmeg and the western yew should be transposed.

THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in cooperation with
The California Academy of Sciences



VOLUME TWENTY-EIGHT
1952

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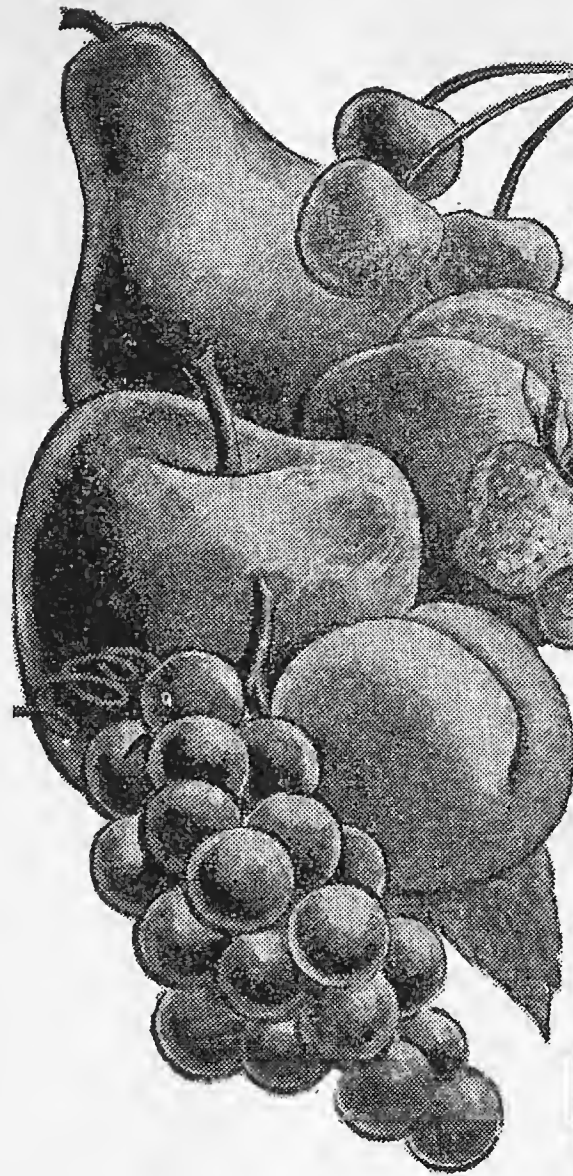
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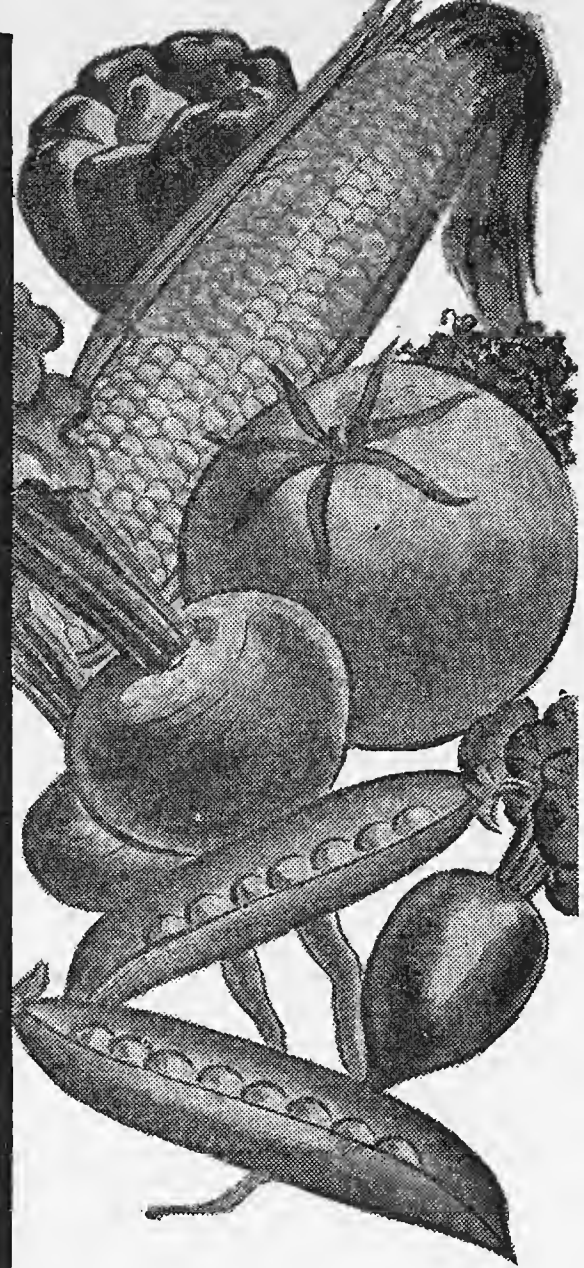
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